HEWLETT PACKARD

Manual Updating Supplement

Supplement HP Part Number: 08590-90109

Supplement Print Date: November 1988

This supplement updates the following document:

HP 8590A Portable RF Spectrum Analyzer Support Manual

Manual HP Part Number: 08590-90096
Manual Print Date: August 1988

What Are Manual Updating Supplements?

A Manual Updating Supplement keeps your manual up-to-date. The supplement, which consists of a cover page and various replacement and/or additional pages for your manual, is shipped with the manual that it updates.

SELECTING THE PAGES TO BE ADDED

The following information helps you select the applicable pages to add supplement information to your manual.

Serial Prefix or Firmware Version

Check the serial prefix or firmware version information on the pages. If there are several versions of a page, select the version that applies to your instrument. For example, your instrument has a serial prefix of 2825A, and the supplement has two versions of one page: *Serial Prefix 2731A and Above*, and *Serial Prefix 2829A and Above*. In this example *Serial Prefix 2731A and Above* applies to your instrument.

Supplement Revision Date

If there are two copies of a page with the same page number and serial prefix, but different revision dates (e.g., Rev. 12JUL87 and Rev. 28AUG87), select the page with the latest revision date.

If there is an All Serials version of a particular piece of information on a page *and* a version identified by a serial prefix that applies to your instrument, select the version with the latest revision date on the bottom of the page. If there are two such pages with different changes, (bars at different places), use both (incorporate one with the other).

If the page already in your manual has a revision date that is *later* than the applicable page in the supplement, keep the page currently in your manual; the manual already may have been updated.

COVER PAGE

The cover page of each Manual Updating Supplement gives the supplement part number and its print date. The supplement print date corresponds to the revision date of the supplement (e.g., Rev. 12JUL87) found at the bottom of the cover page.

The revision date of the supplement is updated each time the supplement changes, but the supplement part number stays the same. For each manual part number there is only one Manual Updating Supplement part number. For example, the manual with HP Part Number 70700-90001 will always have a Manual Updating Supplement with HP Part Number 70700-90047; however, there will be different revision dates of that supplement.

REPLACEMENT OR ADDITIONAL PAGES

A replacement page has the same page number as the page being replaced. Additional pages have page numbers with a decimal number. For example, if one additional page is added between pages 6-5 and 6-6, it will be numbered 6-5.1.

The revision date appearing in the bottom margin each page is the date that the new page was *originally* added to the supplement.

Replacement pages may contain several different types of information:

- new information that was not supplied in the original document
- change information that documents changes to the product that have occurred since the original printing of the manual
- error information (errata) that corrects errors that were present in the original manual

Location of new or changed information is marked with a vertical bar in the outside margin of each replacement.

New and change information is usually tied to a serial prefix or firmware version change; however, information that applies to *all* serials or *all* firmware versions may also be included in the supplement.

The applicable serial prefix or firmware version is printed on each page. If the information applies to all serial numbers of the instrument, the page will contain the notation *All Serials*. Similarly, if a replacement page contains error-correction information, it will contain the notation *Errata*.

INSERTING THE REPLACEMENT AND ADDITIONAL PAGES

After you have selected applicable pages, discard each old page for which you have a new version. Insert the new version of the page. Each replacement page will have the exact page number as the old version.

Additional pages have page numbers with a decimal number. These pages are added to the manual without removing any old pages. For example, if there is one additional page numbered 6-5.1, it should be added between pages 6-5 and 6-6.

Serial Prefix 2837A and Above

HEWLETT PACKARD

HP 8590A Portable RF Spectrum Analyzer
Support Manual
Volume I

(Including Options 001, 021, 022, 023, 030, 040, 908, and 915)

SERIAL NUMBERS

This manual applies directly to instruments serial prefixed 2839A. The Manual Backdating Supplement covers instruments serial prefixed 2618A through 2837A.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in the Installation Manual.

1212 Valley House Drive, Rohnert Park, CA 94928-4999

Manual Part No. 08590-90096

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Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	08590-60004	5	1	KEYBOARD BOARD ASSEMBLY	28480	08590-60004
A1J1	1252-1065	5	1	CONN-POST TYPE .100-PIN-SPCG 24-CONT	28480	1252-1065
A1J2	1251-7678	6	2	CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1251-7678
A1J3	1251-7678	6		CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1251-7678
A1MP1	08590-20004	1	1	BD-KEYBOARD	28480	08590-20004
	08590-68004	1	I	PC KIT CNTR SET	28480	08590-68004
A2	0950-1813	0	1	OEM CRT DATA DISPLAY; 75 X 102 MM	28480	0950-1813
A3	0955-0453	2	1	ATTENUATOR, PROGRAMMABLE 0-60	28480	0955-0453

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4	08590-60047	6	1	1ST CONVERTER ASSEMBLY	28480	08590-60047
A4J1	1250-1796	5	4	CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1796
A4J2	1250-1796	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1796
A4J3	1250-1796	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1796
A4J4	1250-1796	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1796
A4MP1	08558-00052	7	1	GASKET 1ST CONV	28480	08558-00052
A4MP2	08590-20023	4	1	COVER-1ST CONV	28480	08590-20023
A4MP3	08590-20022	3	1	MOUNT-1ST CONV	28480	08590-20022
A4R1	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A4R2	0699-2033	4	1	RESISTOR 237 1% .05W F TC=0+-100	91637	CMF-50-21
A4R3	0699-2032	3	2	RESISTOR 147 1% .05W F TC=0+-100	91637	CMF-50-21
A4R4	0699-1947	7	1	RESISTOR 38.3 1% .05W F TC=0+-100	91637	CMF-50-21
A4R5	0699-2032	3		RESISTOR 147 1% .05W F TC=0+-100	91637	CMF-50-21
A4U1	5082-0765	5	1	DIODE ASSY	28480	5082-0765
	5021-6800	1	1	DIODE MOUNT	28480	5021-6800
				MISCELLANEOUS PARTS		
	2190-0067	4	4	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0067
	2200-0188	9	18	SCREW-MACH 4-40 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A5	08590-60174	0	1	2ND CONVERTER ASSEMBLY	28480	08590-60174
A5C1	0160-3036	8	2	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A5C2	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A5C3	0160-5435	5	1	CAPACITOR-FDTHRU 8.5PF 8% 200V CER	28480	0160-5435
A5C4	0140-0075	7	1	CAPACITOR-FDTHRU 22PF 10% 500V MICA	72982	666-053-01A0-220K
A5CR1	1901-0950	2	1	DIODE-SM SIG SCHOTTKY	28480	1901-0950
A5J1	1250-1157	2	1	CONNECTOR-RF SMA FEM THD-HOLE 50-OHM	28480	1250-1157
A5J2	1250-1435	9	1	CONN:RF: 500 OHM: SMC	28480	1250-1435
A5J3	1250-0691	7	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A5J4	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A5L3	08565-80003	5	1	COIL 2ND CONV	28480	08565-80003
A5L4	9100-2255	4	1	INDUCTOR RF-CH-MLD 470NH 10%	28480	9100-2255
A5MP1	08565-20067	5	1	BLOCK CAVITY	28480	08565-20067
A5MP3	08565-20092	6	1	CAP DIELECTRIC	28480	08565-20092
A5MP3	2200-0151	0	1	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A5MP4	08565-20068	8	1	CAP INNER ELEMENT	28480	08565-20068
A5MP5	08565-60152	7	1	MTG TAB MXR DIO	28480	08565-60152
A5MP5	2200-0171	4	1	SCREW-MACH 4-40 .75-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
A5MP7	3030-0397	8	4	SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP8	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP9	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP10	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP11	0380-0573	8	1	STANDOFF-HEX .625-IN-LG 10-32-THD	28480	0380-0573
A5MP11	2740-0001	3	3	NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP12	2740-0001	3		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP13	2740-0001	3		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP14	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A5MP22	08558-20074	5	1	INSUL CPLG POST	28480	08558-20074
A5R3	0757-0348	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0348
	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
	0360-0002	6	1	TERMINAL-SLDR LUG PL-MTG FOR-#2-SCR	28480	0360-0002
	0360-0043	5	1	TERMINAL-SLDR LUG PL-MTG FOR-#6-SCR	28480	0360-0043
	0520-0173	2	1	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0520-0174	3	2	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	08558-00034	5	1	CPLG LOOP INPUT	28480	08558-00034
	08558-60028	3	1	8D 2ND CONV OSC	28480	08558-60028
	08565-00153	8	2	CPLG LOOP FILTER	28480	08565-00153
	08590-00014	1	1	CVR-OSC HOUSING	28480	08590-00014
	08590-20020	1	1	COVER-2ND CONV	28480	08590-20020
	08590-60033	0	1	CBL ASSY ANL PWR	28480	08590-60033
	08590-60037	4	1	CBL AY-CRT INTEN	28480	08590-60037
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2190-0587	7	3	WASHER-LK INTL T NO. 10 .195-IN-ID	78189	1210-08-00-0551
	2190-0572	6	6	WASHER-LK HLCL NO. 0 .082-IN-ID .1-IN-OD	28480	2190-0572
	2200-0105	4	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0107	6	18	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0118	0	8	SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	3030-0400	2	6	SCREW-SKT HD CAP 0-80 .094-IN-LG SST	00000	ORDER BY DESCRIPTION
	3050-0003	3	1	WASHER-FL MTL NO. 6 .141-IN-ID .375-IN-OD	28480	3050-0003
	3050-0176	1	4	WASHER-FL MTLC NO. 8 .188-IN-ID	11045	AA-0107-2SS
	3050-0945	2	1	WASHER-FL MTLC NO. 10 .2-IN-ID .33-IN-OD	28480	3050-0945
	6040-0454	0	1	THERMAL COMPOUND	28480	6040-0454
	8090-0607	2	1	SOLDER WIRE 351-DE" F .036-W-DIA	28480	8090-0607
A5A1R1	0683-4705	8	1	RESISTOR 47 5% .25W CF TC=0-400	01121	CB4705
A5A1R2	0683-2715	6	1	RESISTOR 270 5% .25W CF TC=0-400	01121	CB2715

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A8	0955-0330	4	1	YIG OSCILLATOR	28480	0955-0330
A8MP1	08590-00009	4	1	SHIELD-YIG	28480	08590-00009
A8MP2	08590-00010	7	1	COVER-SHLD-YIG	28480	08590-00010
A8A1	08590-60029	4	1	YIG BOARD ASSEMBLY	28480	08590-60029
A8A1J1	1251-7683	3	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	00779	87227-5
A8A1MP2	1251-3172	7	1	CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A8A1MP3	1251-2313	6	1	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A8A1VR1	1902-3224	1	1	DIODE-ZNR 17.8V 5% DO-35 PD=0.4W	28480	1902-3224
A8A1VR2	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=0.4W	28480	1902-0049

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A14Q11	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q12	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q13	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q14	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q15	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q16	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q17	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q18	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q19	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q20	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q21	1854-1030	0	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-1030
A14Q22	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q24	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q25	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14R1	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1331-F
A14R2	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R3	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A14R4	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A14R5	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-F
A14R6	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R7	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A14R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R9	0698-3460	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4222-F
A14R10	2100-2633	5	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	73138	82PAR1K
A14R11	0698-6153			RESISTOR 3.83K		
A14R12	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A14R13	0757-0401	0	8	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R14	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-6192-F
A14R15	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A14R16	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A14R17	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-9092-F
A14R18	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1782-F
A14R19	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A14R20	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-F
A14R21	2100-2489	9	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	82PAR5K
A14R22	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1963-F
A14R23	2100-2514	1	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	73138	82PAR20K
A14R24	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R25	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R26	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R27	2100-2489	9		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	82PAR5K
A14R28	0757-0346	2	14	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R30	2100-2522	1	3	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R33	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R34	2100-2521	0	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	73138	82PAR2K
A14R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R36	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R37	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R38	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2871-F
A14R39	2100-2520	9	1	RESISTOR-TRMR 50 20% C SIDE-ADJ 1-TRN	73138	82PAR50
A14R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R41	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-6191-F
A14R42	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5621-F
A14R43	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1622-F
A14R44	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	CT4-1/8-T0-751-F
A14R45	0698-3444	1	8	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R46	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-F
A14R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R48	0698-3150	6	4	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R49	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2610-F
A14R50	0757-0279	0	4	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14R51	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R52	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R53	0757-0444	1	6	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R54	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R55	0757-0440	7	7	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R56	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R57	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R58	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R59	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R60	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R62	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R63	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R64	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R65	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R66	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R67	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R68	0698-8958	2	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A14R69	2100-2892	6	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	73138	82PAR1M
A14R70	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R71	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A14R72	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R73	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R74	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R75	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R76	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R77	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R78	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R79	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R80	0757-0289	2	6	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R81	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R82	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R83	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R84	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R85	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A14R86	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R87	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R88	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R89	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R90	0757-0403	2	2	RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A14R91	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R92	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R93	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3831-F
A14R94	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R95	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R96	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R97	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R98	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R99	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R100	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A14R101	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3831-F
A14R102	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R103	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R104	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R105	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R106	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	CT4-1/8-T0-562R-F
A14R107	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-F
A14R108	0698-3434	9	1	RESISTOR 34.8 1% .125W F TC=0+-100	28480	0698-3434
A14R109	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	CT4-1/8-T0-90R9-F
A14R110	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	CT4-1/8-T0-619R-F
A14R111	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A14R112	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R113	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R114	0698-3138	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1782-F
A14R115	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A21	08590-60012	5	1	RS-232 I/O BOARD ASSEMBLY	28480	08590-60012
A21C1	0160-4835	7	6	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C7	0180-0118	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	1S0D685X903582
A21J1	1252-1489	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A21J2	1252-1036	0	1	CONN-POST TYPE .100-PIN-SPCG 26-CONT	28480	1252-1036
A21R1	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21R2	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21R3	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21U1	1820-3623	0	1	IC-ASYNCHRONOUS COMM.INTERFACE	27014	INS8250AN
A21U2	1820-3322	6	1	IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488P
A21U3	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A21U4	1820-3321	5	1	IC RCVR DTL COMM EIA RS-232C QUAD	04713	MC1489AP
A21U5	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
A21U6	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A21U7	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A21U8	1826-0300	6	1	IC V RGLTR TO-39	07263	79M12HC
A22	08590-60019	2	1	RS 232 CONNECTOR ASSY	28480	08590-60019

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23	08590-60013	6	1	HP-IL I/O BOARD ASSEMBLY	28480	08590-60013
A23C1	0180-0374	3	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X902082
A23C2	0160-4835	7	3	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A23C3	0160-4800	6	1	CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A23C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A23C5	0160-4835	7		CAPACITOR-FXD 1.UF +-10% 50VCD CER	28480	0160-4835
A23J1	1252-1469	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A23J2	1252-1287	3	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	28480	1252-1287
A23L1	9100-1631	8	1	INDUCTOR RF-CH-MLD 56UH 5%	28480	9100-1631
A23R1	0757-0442	9	1	RESISTOR 10K 1% .125W F TC+0+-100	24546	CT4-1/8-T0-1002-F
A23U1	1LB3-0003	8	1	HP-IL CHIP	28480	1LB3-0003
A23U2	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A23U3	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A23U4	1810-0651	7	1	NETWORK-RDC 10 PIN SIP; R1=R2=15K+-5%	28480	1810-0651
A23U5	9100-4226	3	1	TRANSFORMER	28480	9100-4226
A24	08590-60020	5	1	HP-IL CBL CONNECTOR ASSY	28480	08590-60020
A25	0955-0454	3	1	YIG OSCILLATOR 2-4 GHz	28480	0955-0454

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
	08590-60010	3	1	COVER ASSY INSTRUMENT	28480	08590-60010
	08590-00004	9	1	COVER INSTRUMENT	28480	08590-00004
	08590-40002	1	2	SPACER FOOT-REAR	28480	08590-40002
	0900-0024	8	4	O-RING .145-IN-ID .07-IN-XSECT-DIA SIL	51633	AS568-007 (SILICONE-60 DURO)
	1460-2164	8	2	SPRING COMPRESSION	28480	1460-2164
	2190-0587	3	4	WASHER-LK HLCL 5.0 MM 5.1-MM-ID	28480	2190-0587
	5001-8728	4	2	PLATE BACKUP	28480	5001-8728
	5021-6332	4	1	PLATE HANDLE	28480	5021-6332
	5021-6343	7	2	GEAR PINION	28480	5021-6343
	5021-6344	8	2	SOCKET-GEAR	28480	5021-6344
	5041-3937	1	2	FOOT REAR	28480	5041-3937
	5041-3990	6	1	HANDLE	28480	5041-3990
	5041-3991	7	2	TRIM CAP-HANDLE	28480	5041-3991
	08590-60031	8	1	PAD ASSY-MATCHING 75 OHM	28480	08590-60031
	08590-60060	9	1	PAD ASSY-MATCHING	28480	08590-60060

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CABLES (SEE FIGURE 3-2)		
A3W1	08590-60034	1	1	CABLE ASSY, ATTENUATOR	28480	08590-60034
A5W1	08590-60033	0	1	CABLE ASSY, ANALOG POWER	28480	08590-60033
A6W1	08590-60035	2	1	CABLE ASSY, YIG POWER	28480	08590-60035
A20W1	08590-60016	9	1	CABLE ASSY, LINE POWER	28480	08590-60016
W1	08590-60024	9	1	CABLE ASSY 1 LO OUTPUT	28480	08590-60024
W2	08590-60026	1	1	CABLE ASSY, CAL OUTPUT	28480	08590-60026
W2	08590-60028	3	1	CABLE ASSY, CAL OUT	28480	08590-60028
W3	08590-60065	8	1	CABLE ASSY, PROBE POWER	28480	08590-60065
W4	08590-60023	8	1	CABLE ASSY, RF INPUT	28480	08590-60023
W5	5061-9026	3	1	WIRING ASSY, RPG	28480	5061-9026
W6	08590-60014	7	1	CABLE ASSY, RIBBON 24C	28480	08590-60014
W7	08590-60021	6	1	CABLE ASSY, VIDEO	28480	08590-60021
W8	08590-20151	9	1	CABLE ASSY, YIG TO FIRST CONV	28480	08590-20151
W9	08590-20059	6	1	CABLE ASSY, LPF TO 2ND CONV.	28480	08590-20059
W10	08590-20007	4	1	CABLE ASSY, RF ATTEN - 1ST	28480	08590-20007
W11	08590-60022	7	1	CABLE ASSY, DC POWER	28480	08590-60022
W12	8120-4823	7	36	CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W13	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W14	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W15	08590-60025	0	1	CABLE ASSY, SECOND CONV-SEC. IF	28480	08590-60025
W16	08590-60027	2	1	CABLE ASSY, 2ND IF TO 3RD MIXER	28480	08590-60027
W17				SEE A18, A21 & A23 P/O REMOTE I/O ASSYS		
W18	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W19	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W20	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W22	08590-20058	5	1	CABLE ASSY, FIRST CONV TO LPF	28480	08590-20058
W23	08590-60041	0	1	CABLE ASSY, INTENSITY POT	28480	08590-60041
W24	5062-0784	4	1	CABLE ASSY, LINE SWITCH	28480	5062-0784
W25	08590-60017	0	1	CABLE ASSY, LINE SELECT	28480	08590-60017
W26	08590-60037	4		CABLE ASSY, CRT INTENSITY	28480	08590-60037

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
	08590-60010	3	1	COVER ASSY INSTRUMENT	28480	08590-60010
	08590-00004	9	1	COVER INSTRUMENT	28480	08590-00004
	08590-40002	1	2	SPACER FOOT-REAR	28480	08590-40002
	0900-0024	8	4	O-RING .145-IN-ID .07-IN-XSECT-DIA SIL	51633	AS568-007 (SILICONE-60 DURO)
	1460-2164	8	2	SPRING COMPRESSION	28480	1460-2164
	2190-0587	3	4	WASHER-LK HLCL 5.0 MM 5.1-MM-ID	28480	2190-0587
	5001-8728	4	2	PLATE BACKUP	28480	5001-8728
	5021-6332	4	1	PLATE HANDLE	28480	5021-6332
	5021-6343	7	2	GEAR RING	28480	5021-6343
	5021-6344	8	2	SOCKET-GEAR	28480	5021-6344
	5041-3937	1	2	FOOT REAR	28480	5041-3937
	5041-3990	6	1	HANDLE	28480	5041-3990
	5041-3991	7	2	TRIM CAP-HANDLE	28480	5041-3991
	08590-60031	9	1	PAD ASSY-MATCHING 75 OHM	28480	08590-60031
	08590-60060	9	1	PAD ASSY-MATCHING	28480	08590-60060

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CABLES (SEE FIGURE 3-2)		
A3W1	08590-60034	1	1	CABLE ASSY, ATTENUATOR	28480	08590-60034
A5W1	08590-60033	0	1	CABLE ASSY, ANALOG POWER	28480	08590-60033
A6W1	08590-60035	2	1	CABLE ASSY, YIG POWER	28480	08590-60035
A20W1	08590-60016	9	1	CABLE ASSY, LINE POWER	28480	08590-60016
W1	08590-60024	9	1	CABLE ASSY 1 LO OUTPUT	28480	08590-60024
W2	08590-60026	1	1	CABLE ASSY, CAL OUTPUT	28480	08590-60026
W2	08590-60028	3	1	CABLE ASSY, CAL OUT	28480	08590-60028
W3	08590-60065	8	1	CABLE ASSY, PROBE POWER	28480	08590-60065
W4 *	08590-60023	8	1	CABLE ASSY, RF INPUT*	28480	08590-60023
W5	5061-9026	3	1	WIRING ASSY, RPG	28480	5061-9026
W6	08590-60014	7	1	CABLE ASSY, RIBBON 24C	28480	08590-60014
W7	08590-60021	6	1	CABLE ASSY, VIDEO	28480	08590-60021
W8	08590-20151	9	1	CABLE ASSY, ISOLATOR TO FIRST CONV	28480	08590-20151
W9	08590-20059	6	1	CABLE ASSY, LPF TO 2ND CONV.	28480	08590-20059
W10	08590-20007	4	1	CABLE ASSY, RF ATTEN - 1ST	28480	08590-20007
W11	08590-60022	7	1	CABLE ASSY, DC POWER	28480	08590-60022
W12	8120-4823	7	36	CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W13	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W14	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W15	08590-60015	8	1	CABLE ASSY, SECOND CONV-SEC. IF	28480	08590-60015
W16	08590-60027	2	1	CABLE ASSY, 2ND IF TO 3RD MIXER	28480	08590-60027
W17				SEE A18, A21 & A23 P/O REMOTE I/O ASSYS		
W18	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W19	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W20	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W22	08590-20058	5	1	CABLE ASSY, FIRST CONV TO LPF	28480	08590-20058
W23	08590-60041	0	1	CABLE ASSY, INTENSITY POT	28480	08590-60041
W24	5062-1998	4	1	CABLE ASSY, LINE SWITCH	28480	5062-1998
W25	08590-60017	0	1	CABLE ASSY, LINE SELECT	28480	08590-60017
W26	08590-60037	4		CABLE ASSY, CRT INTENSITY		
				* NOTE: OPTIONS H07 AND H51 RF INPUT CABLE ASSEMBLY IS HP PART NUMBER 08590-20156		

See introduction to this section for ordering information.
* Indicates factory selected value.

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
	08590-60010	3	1	COVER ASSY INSTRUMENT	28480	08590-60010
	08590-00004	9	1	COVER INSTRUMENT	28480	08590-00004
	08590-40002	1	2	SPACER FOOT-REAR	28480	08590-40002
	0900-0024	8	4	O-RING .145-IN-ID .07-IN-XSECT-DIA SIL	51633	AS568-007 (SILICONE-60 DURO)
	1460-2164	8	2	SPRING COMPRESSION	28480	1460-2164
	2190-0587	3	4	WASHER-LK HLCL 5.0 MM 5.1-MM-ID	28480	2190-0587
	5001-8728	4	2	PLATE BACKUP	28480	5001-8728
	5021-6332	4	1	PLATE HANDLE	28480	5021-6332
	5021-6343	7	2	GEAR PING	28480	5021-6343
	5021-6344	8	2	SOCKET-GEAR	28480	5021-6344
	5041-3937	1	2	FOOT REAR	28480	5041-3937
	5041-3990	6	1	HANDLE	28480	5041-3990
	5041-3991	7	2	TRIM CAP-HANDLE	28480	5041-3991
	08590-60031	8	1	PAD ASSY-MATCHING 75 OHM	28480	08590-60031
	08590-60090	9	1	PAD ASSY-MATCHING	28480	08590-60090

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
					CABLES	(SEE FIGURE 3-2)
				CABLES (SEE FIGURE 3-2)		
A3W1	08590-60034	1	1	CABLE ASSY, ATTENUATOR	28480	08590-60034
A5W1	08590-60033	0	1	CABLE ASSY, ANALOG POWER	28480	08590-60033
A6W1	08590-60035	2	1	CABLE ASSY, YIG POWER	28480	08590-60035
A20W1	08590-60016	9	1	CABLE ASSY, LINE POWER	28480	08590-60016
W1	08590-60024	9	1	CABLE ASSY 1 LO OUTPUT	28480	08590-60024
W2	08590-60026	1	1	CABLE ASSY, CAL OUTPUT	28480	08590-60026
W2	08590-60028	3	1	CABLE ASSY, CAL OUT	28480	08590-60028
W3	08590-60065	8	1	CABLE ASSY, PROBE POWER	28480	08590-60065
W4	08590-60023	8	1	CABLE ASSY, RF INPUT*	28480	08590-60023
W5	5061-9026	3	1	WIRING ASSY, RPG	28480	5061-9026
W6	08590-60014	7	1	CABLE ASSY, RIBBON 24C	28480	08590-60014
W7	08590-60021	6	1	CABLE ASSY, VIDEO	28480	08590-60021
W8	08590-20057	4	1	CABLE ASSY, ISOLATOR TO FIRST CONV	28480	08590-20057
W9	08590-20059	6	1	CABLE ASSY, LPF TO 2ND CONV.	28480	08590-20059
W10	08590-20007	4	1	CABLE ASSY, RF ATTEN - 1ST	28480	08590-20007
W11	08590-60022	7	1	CABLE ASSY, DC POWER	28480	08590-60022
W12	8120-4823	7	36	CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W13	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W14	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W15	08590-60015	8	1	CABLE ASSY, SECOND CONV-SEC. IF	28480	08590-60015
W16	08590-60027	2	1	CABLE ASSY, 2ND IF TO 3RD MIXER	28480	08590-60027
W17				SEE A18, A21 & A23 P/O REMOTE I/O ASSYS		
W18	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W19	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W20	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W21	08590-20056	3	1	CABLE ASSY, YIG TO ISOLATOR	28480	08590-20056
W22	08590-20058	5	1	CABLE ASSY, FIRST CONV TO LPF	28480	08590-20058
W23	08590-60041	0	1	CABLE ASSY, INTENSITY POT	28480	08590-60041
W24	5062-0784	4	1	CABLE ASSY, LINE SWITCH	28480	5062-0784
W25	08590-60017	0	1	CABLE ASSY, LINE SELECT	28480	08590-60017
W26	08590-60037	4		CABLE ASSY, CRT INTENSITY		
				* NOTE: OPTIONS H07 AND H51 RF INPUT CABLE ASSEMBLY IS HP PART NUMBER 08590-20156		

See introduction to this section for ordering information.
* Indicates factory selected value.

Serial Prefix 2837A and Above

HEWLETT PACKARD

HP 8590A Portable RF Spectrum Analyzer
Support Manual
Volume II

(Including Options 001, 021, 02_, 023, 030, 040, 908, and 915)

SERIAL NUMBERS

This support manual applies directly to instruments serial prefixed 2839A. The Manual Backdating Supplement covers instruments serial prefixed 2618A through 2837A.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in the Installation Manual.

Manual Part No. 08590-90096

Printed August 1988
Rev. 25NOV88

LIST OF FIGURES

LIST OF TABLES

SAFETY SYMBOLS

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.

Indicates dangerous voltages are present. Be extremely careful.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

The WARNING sign denotes a hazard. It calls attentions to a procedure that, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective condutor of the ac power cable to a socket outlet provided with the protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal, can result in personal injury.

WARNING

There are voltages at many points in the instrument that can, if contacted, cause personal injury. Be extremely careful! Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

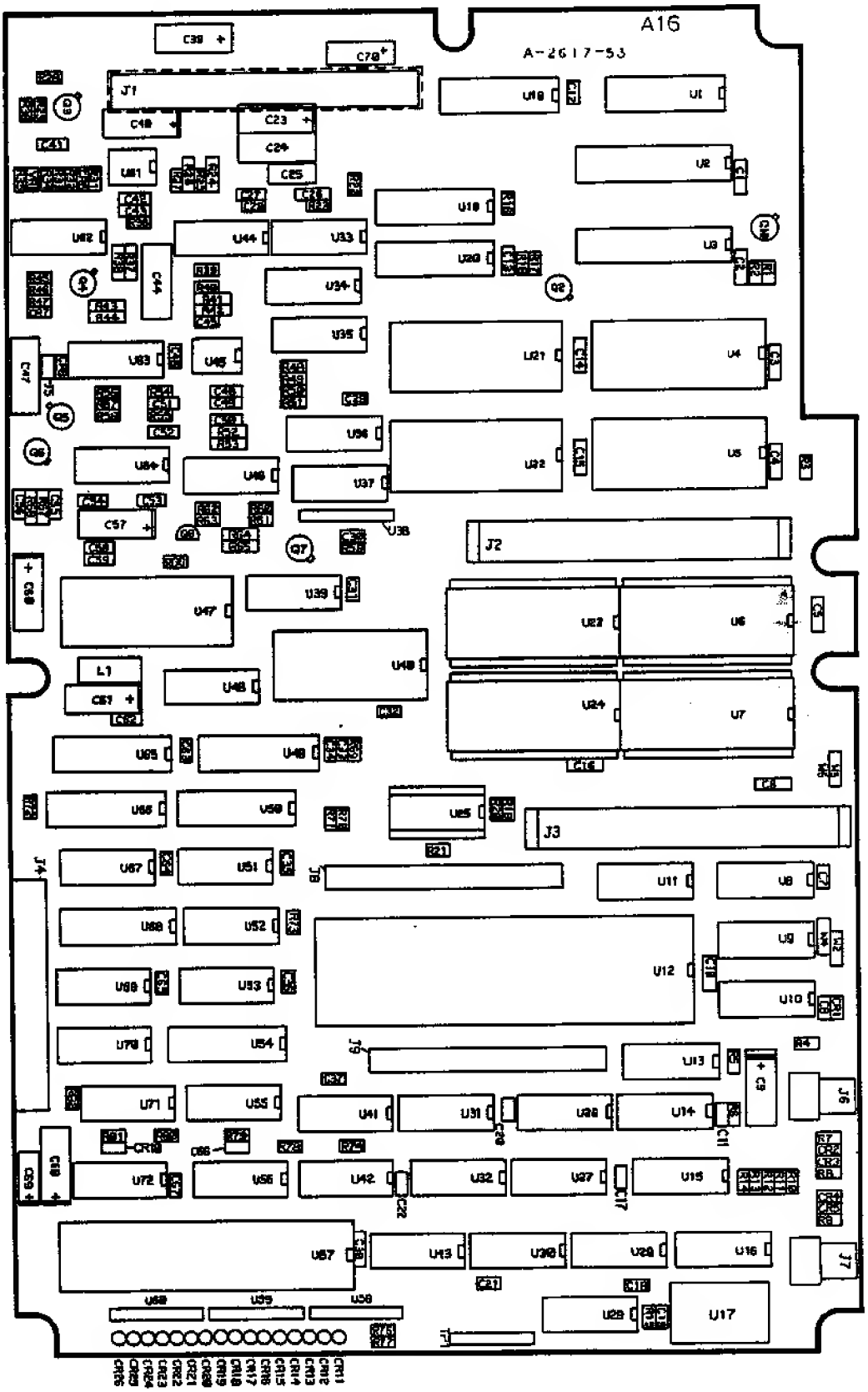

Figure 5-40. Processor A/D Component Locations

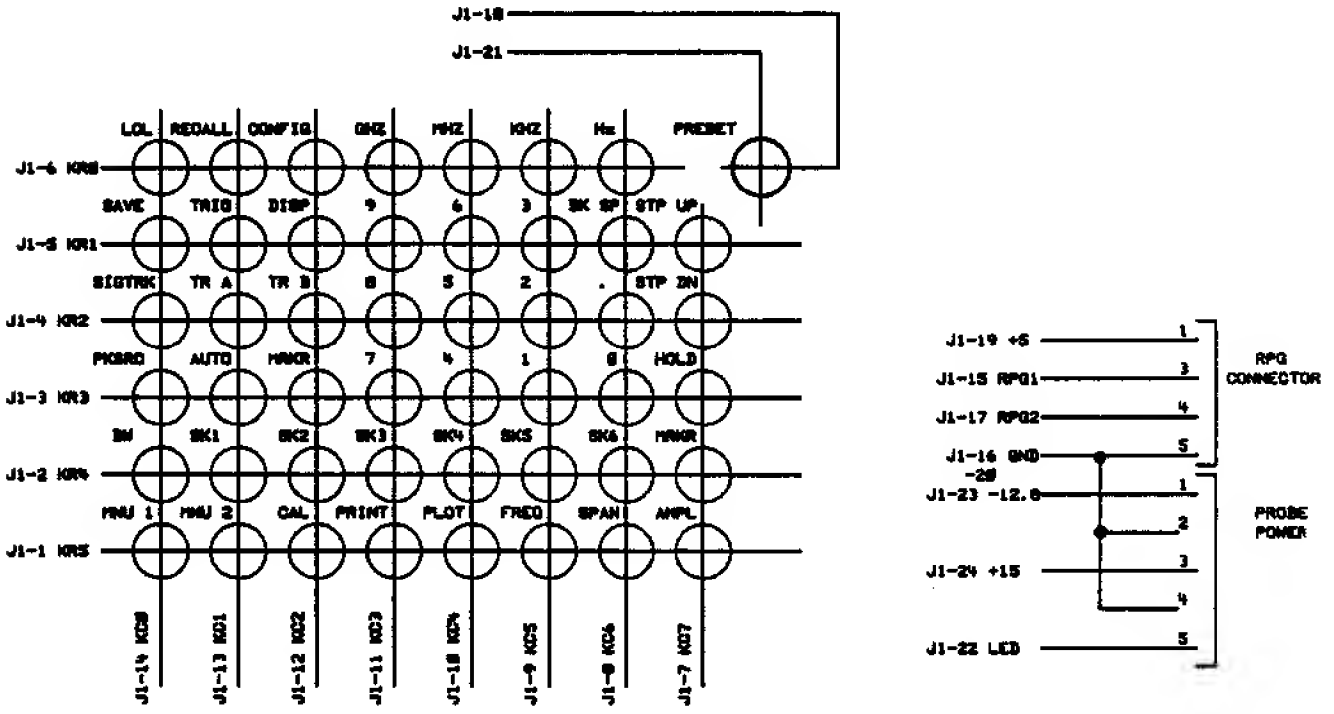

Figure 5-40.1 A1 Keyboard Assembly Schematic

CHAPTER 6

MANUAL BACKDATING CHANGES

6-1. INTRODUCTION

6-2. This manual has been written for and applies directly to instruments with serial numbers prefixed 2737A. Earlier versions of the instrument (serial number prefixes lower than the one indicated) may be slightly different in design or appearance. The purpose of this section of the manual is to document these differences. With the information provided in this section, this manual can be corrected so it applies to instruments with serial numbers prefixed 2618A through 2816A. If your instrument is in this range, use the pages in this section to replace the corresponding pages in Chapters 1 through 5.

Serial Prefix or Firmware Version

Check the serial prefix or firmware version information on the pages. If there are several versions of a page, select the version that applies to your instrument. For example, your instrument has a serial prefix of 2825A, and the supplement has two versions of one page: *Serial Prefix 2731A and Above, and Serial Prefix 2829A and Below.* In this example, *Serial Prefix 2829A and Below* applies to your instrument.

Inserting the Replacement Pages

After you have selected applicable pages, discard each page for which you have a different version. Insert the version of the page that applies to your instrument.

Each replacement page will have the exact page number as the discarded version

Later versions of the instrument (serial number prefixes highter than the one indicated on the title page) are documented in Manual Updating supplements. Complimentary copies of relevant supplements can be obtained from your nearest Hewlett-Packard office.

HEWLETT PACKARD

HP 8590A Portable RF Spectrum Analyzer
Support Manual
Volume I

(Including Options 001, 021, 022, 023, 030, 040, 908, and 915)

SERIAL NUMBERS

This manual applies directly to instruments serial prefixed 2837A. The Manual Backdating Supplement covers instruments serial prefixed 2618A through 2816A.

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1212 Valley House Drive, Rohnert Park, CA 94928-4999

Manual Part No. 08590-90096

Printed August 1988

HP 8590A Documentation Description

Manuals shipped with your instrument:

Installation Manual, HP Part Number 08590-90003

- Tells you how to install the spectrum analyzer.
- Tells you what to do in case of a failure.

Operating Manual, HP Part Number 08590-90005

- Tells you how to make measurements with your spectrum analyzer.
- Describes spectrum analyzer features.

Options:

Support Manual (Option 915), HP Part Number 08590-90096
(Option includes extra copy of *Installation Manual,* HP Part Number 08590-90003)

- Describes troubleshooting and repair of the spectrum analyzer.

Programming Manuals, HP Part Numbers:

HP-IB . . . . . .08590-90011 (Option 021)
HP-IL . . . . . .08590-90013 (Option 022)
RS-232 . . . . . .08590-90015 (Option 023)

- Describes spectrum analyzer operation via a remote controller (computer).

How to Use This Manual

The support package (Option 915) for the Hewlett-Packard 8590A Spectrum Analyzer comprises this two volume Support Manual and the accompanying documentation package. The Support Manual references instrument specifications and operational tests described in the Installation Manual.

You will use the support manual, which is designed for service personnel who have a basic understanding of spectrum analyzer theory and operation, for:

- Performance tests
- Adjustment procedures
- Replaceable parts
- Troubleshooting and repairs

In Volume I, to verify proper performance and calibration of the analyzer, refer to the performance tests in Chapter 1. Calibration adjustments are described in Chapter 2. Part numbers for all replaceable parts are listed in Chapter 3. Chapter 4 provides troubleshooting hints and repair information. Descriptions of major assemblies in the analyzer are presented in Chapter 5; assemblies A3 through A13 are in Volume I.

Chapter 5 continues in Volume II, with descriptions of assemblies A14 through A24. Chapter 6, Manual Backdating, covers additional information for instruments prefixed below 2837A, and provides a convenient archive for manual pages replaced by future Manual Updating supplements. Appendix A provides monitor servicing instructions, and Appendix B discusses using the analyzer with the HP 82913A monitor.

A Table of Contents in each volume directs you to particular topics.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective condutor of the ac power cable to a socket outlet provided with the protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal, can result in personal injury.

WARNING

There are voltages at many points in the instrument that can, if contacted, cause personal injury. Be extremely careful! Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

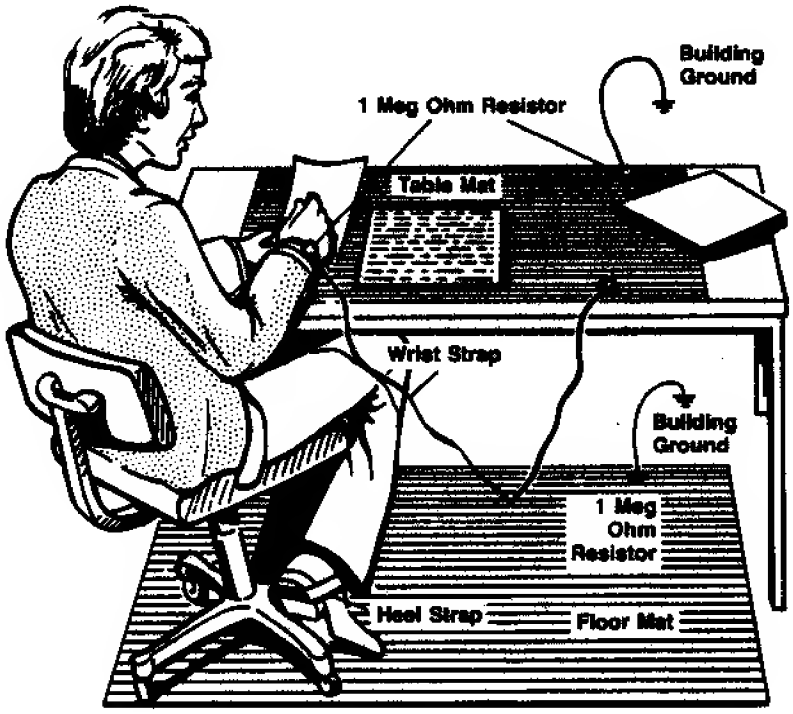
ELECTROSTATIC DISCHARGE

Electrostatic discharge (ESD) can damage or destroy electronic components. Therefore, all work performed on assemblies consisting of electronic components sould be done at a static-safe work station.

Shown below is an example of a static-safe work station, using two types of ESD protection:

- conductive table mat and wrist-strap combination
- conductive floor mat and heel-strap combination

These methods may be used together or separately. (A list of static-safe accessories is given on the next page.)



Example of the Static-safe Work Station

Reducing Damage Caused by ESD

The following suggestions may help reduce ESD damage that occurs during testing and servicing operations.

- Before connecting any coaxial cable to an analyzer connector for the first time each day, momentarily ground the center and outer conductors of the cable.
- Personnel should be grounded with a resistor-isolated wrist strap before touching the center pin of any connector and before removing any assembly from the unit.
- Be sure all instruments are properly earth-grounded to prevent buildup of static charge.

Static-safe Accessories

Static-safe accessories can be purchased from Hewlett-Packard by using the HP part numbers listed below.

Static-safe Accessories

HP Part Number	Description
Note: the following items can be ordered through any Hewlett-Packard Sales and Service office.	
9300-0797	3M static control mat, 0.6 m x 1.2 m (2 ft. x 4 ft) 4.6 m (15 ft) ground wire wrist strap and attachment cord
9300-0980	Wrist strap cord, 1.5 m (5 ft)
9300-0985	Wrist strap (large)
9300-0986	Wrist strap (small)
9300-1169	ESD heel strap (reusable 6 to 12 months)
9300-0793	Shoe ground strap (one-time use only)

WARNING

The HP 8590A Spectrum Analyzer contains potentially hazardous voltages. Refer to the safety symbols provided on the analyzer and the general safety instructions in this manual before operating the unit with the covers removed. Ensure that safety instructions are strictly followed. Failure to do so can result in severe or fatal injury.

Look @ installation verification manual.

CHAPTER 1

PERFORMANCE VERIFICATION

Introduction

The procedures in this chapter test the analyzer's electrical performance using the specifications of Table 1-1 in the Installation Manual (HP Part Number 08590-90003).

You must complete 14 tests to verify that analyzer performance meets all the specifications. The Installation Manual contains five tests that constitute Operation Verification. This chapter contains the remaining nine tests. Table 1-1 lists all the tests and indicates which manual contains each test. You must do the tests in the order shown in the table.

None of the performance tests require access to the interior of the analyzer.

Table 1-1. HP 8590A Spectrum Analyzer Performance Tests

Test Name	Test Type	Manual Location
Frequency Readout Accuracy	Operation Verification	Installation Manual
Displayed Average Noise Level	Operation Verification	Installation Manual
Frequency Response	Operation Verification	Installation Manual
Calibrator Amplitude and Frequency Accuracy	Operation Verification	Installation Manual
Frequency Span Readout Accuracy	Operation Verification	Installation Manual
Sweep Time Accuracy	Performance Verification	this chapter
Noise Sideband	Performance Verification	this chapter
Spurious Response	Performance Verification	this chapter
Residual Response	Performance Verification	this chapter
Reference Level Accuracy	Performance Verification	this chapter
Scale Fidelity	Performance Verification	this chapter
Frequency Drift	Performance Verification	this chapter
Resolution Bandwidth Switching	Performance Verification	this chapter
Gain Compression	Performance Verification	this chapter

Before You Start

There are five things you must do before attempting the performance tests in this chapter:

1. Switch the analyzer on and let it warm up. If the analyzer was stored in an area where the ambient temperature is within the specified operating range (0 to 50°C), a 30-minute warmup is required. If the storage temperature was less than 0°C, warm up the analyzer for at least 2 hours.

2. Read Chapter 1 of the Operating Manual, "Making Your First Measurement."

3. After the analyzer has warmed up as specified, perform the Calibration procedure documented in "Making Your First Measurement." The performance of the analyzer is specified only after the calibration routines have been run.

4. Complete the Operation Verification tests in the Installation Manual, and record test results on a copy of the specified test record.

5. Read the rest of this section before you start any of the tests, and make a copy of the Performance Test Record described below.

Test Equipment You'll Need

Table 1-2 lists the recommended test equipment needed to maintain and test the analyzer. Each test includes a list of the equipment and accessories required for that test. Although Hewlett-Packard equipment is recommended, equivalent equipment may be used provided it meets the critical specifications shown in Table 1-2.

Recording the Test Results

Record the results on a copy of the Performance Verification Test Record (see page 1-31). The test record lists the specifications and acceptable limits for each analyzer test. The filled-out test record can be kept for later reference, if desired.

If the Analyzer Doesn't Meet Specifications

If the analyzer doesn't meet one of the specifications, complete any remaining tests in this chapter and record all test results on a copy of the test record.

Periodically Verifying Operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year. The Operation Verification tests in the Installation Manual can be done to check about 80% of analyzer functions. However, the additional tests in this chapter should be done to fully verify analyzer performance.

Table 1-2. Recommended Test Equipment

Equipment	Critical Specifications	Recommended Model	Use*
50-ohm Termination	not critical	HP 11593A	P
Power Splitter	equivalent output SWR: <1.2/1 frequency range: 10 MHz to 2 GHz maximum input power: > -10 dBm	HP 11667A	P
1-dB Step Attenuator	frequency range: dc to 1 GHz accuracy: ± 0.25 dB calibrated at 30 MHz	HP 355C-H80	P,A
10-dB Step Attenuator	frequency range: dc to 1 GHz accuracy: ± 1.5 dB calibrated at 30 MHz	HP 355D-H82	P,A
Logic Pulser	TTL voltage and current drive levels	HP 546A	T
Digital Current Tracer	Sensitivity: 1 mA to 500 mA Frequency response: pulse trains to 10 MHz Minimum pulse width: 50 nS Pulse risetime: < 200 nS	HP 547A	T
Logic Clip	TTL voltage and current drive levels	HP 548A	T
Synthesizer	frequency accuracy: 1×10^{-9}/day output flatness: ± 0.5 dB frequency range: 50 to 100 MHz	HP 3335A	P
Synthesizer Function Generator	harmonics: <-25 dB sinewave amplitude accuracy: ± 0.2 dB frequency resolution: 0.001 Hz	HP 3325A	P
Digital Voltmeter	input resistance: $>1 \times 10^{10}$ ohms accuracy: ± 0.0011% plus three counts (100-V scale)	HP 3456A	A,T
Digital Multimeter	input resistance: $>1 \times 10^{10}$ ohms accuracy: ± 0.004% plus one count (100-V scale)	HP 3455A (alternative to HP 3456A)	A,T
Power Meter	measure levels 0 to -90 dBm accuracy: ± 0.5%	HP 436A	P,A,T

* P=Performance Test; A=Adjustment/Calibration; T=Troubleshooting

Table 1-2. Recommended Test Equipment (continued)

Equipment	Critical Specifications	Recommended Model	Use*
Crystal Detector	frequency range: .1 to 1.5 GHz	HP 423A	P
Frequency Counter	frequency range: 500 to 1,500 MHz accuracy: ± 1 count	HP 5342A	A,T
Frequency Counter	frequency range: 0.1 to 500 MHz accuracy: ± 1 count	HP 5383A	A,T
Sweep Oscillator	frequency accuracy: 1×10^{-9}/day output flatness: within ± 0.6 dB	HP 8340A	P
Sweep Oscillator	output flatness: within ± 0.6 dB	HP 8350A/83522A (alternative to HP 8340A for frequency response test)	P
Comb Generator	1, 10, 100 MHz combs accuracy: ± 0.01%	HP 8406A	P,A,T
Power Sensor	frequency range: 100 kHz to 2 GHz power range: 0.01 to 1 mW	HP 8482A	P,A,T
Power Sensor	frequency range: 10 MHz to 18 GHz power range: -70 dBm to 20 dBm maximum power: 200 mW	HP 8484A	P
10-dB Attenuator (2 required)	frequency range: 10 to 1500 MHz accuracy: ± 5%	HP 8491A	P
Signal Generator (2 required)	frequency range: 500 kHz to >500 MHz AM modulation: >20 Hz with external signal pulse modulation: 500-Hz PRF, >.002 ms pulse output flatness: ± 0.5 dB spurious: <-100 dBc	HP 8640B (alternative to HP 8340A for frequency readout accuracy up to 1024 MHz)	P,A,T

* P=Performance Test; A=Adjustment/Calibration; T=Troubleshooting

Table 1-2. Recommended Test Equipment (continued)

Equipment	Critical Specification	Recommended Model	Use*
Signal Generator	frequency range: 100 kHz to 2115 MHz	HP 8642B (also alternative to HP 8340A for frequency readout acccuracy and frequency response tests)	P
Directional Bridge	frequency range: 0.1 to 110 MHz directivity: >40 dB VSWR maximum: 1.1/1 arm loss: <6 dB	HP 8721A	P
Low-Pass Filter	300 MHz low pass, rejection of unwanted signals: >35 dB	Telenic TLP 300-4AB	P, A, T
Adapter (~~2 required~~)	BNC(f) to BNC(m), 50Ω	HP 1250-~~1288~~ 0216	P
Adapter (3 required)	N(m) to BNC(f)	HP 1250-0780	P
Adapter	N(m) to BNC(m)	HP 1250-0082	P
Adapter	BNC tee	HP 1250-0781	P
Adapter	BNC(f) to alligator clips	HP 8120-1292	A
Adapter	SMC(m) to SMC(m)	HP 1250-0827	A
Test Cable	SMC(f) to BNC(m)	HP 11592-60001	A
Cable Assembly	banana plug alligator clips	HP 11102A	A
BNC Cable (4 required)	120 cm (48 inch)	HP 10503A	P, A, T
BNC Cable	20 cm (9 inch)	HP 10502A	P, A, T
Special Adapter	(per Figure 2-2)	HP 1250-1113	A
Extender Board	used for Analog Interface A7	HP 70205-60023	T
Special Extender Board	with 51 ohm resistor w/HP 0757-0394	HP 08505-60109	A, T
Crystal Shorts (3 required)	(per Figure 2-8)	–	A, T
Additional Equipment for Option 001: NOTE: Use a 75 ohm to 50 ohm adapter, and change display units to dBm before attempting the following tests.			
75 ohm Termination	not critical	HP 11652-60012	P, A, T
Minimum Loss Adapter (75 ohm to 50 ohm)	frequency range: 0.1 to 1500 MHz maximum loss: <3 dB	HP 08558-60031	P, A, T
BNC Cable	30 cm (12 inch), 75 ohm	HP 11652-60012	P, A, T
Adapter	SMA(f) to SMA(f)	HP 1250-1158	P, A, T
Adapter	BNC(f) to SMA(m)	HP 1250-1200	P, A, T

* P = Performance Test; A = Adjustment/Calibration; T = Troubleshooting

Sweep Time Accuracy Test

This test uses a synthesizer function generator to amplitude modulate a 500–MHz, CW signal from another signal generator. The analyzer demodulates this signal in zero span to display the signal pulses in time domain (i.e., like an oscilloscope). The marker delta function of the analyzer is used to read out the sweep time.

Specification

Frequency Sweep Readout Accuracy: < ± 10% of indicated sweep time setting.

Equipment

Synthesizer Function Generator	HP 3325A
Signal Generator	HP 8640B
BNC Cable 120 cm (48 in)	HP 10503A
BNC Cable 20 cm (9 in)	HP 10502A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP ~~08558-60031~~ 11981A (08591-60090)
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure

1. Set the signal generator to output a 500–MHz, –10 dBm, CW signal. Set the AM and FM controls OFF.

2. Set the synthesizer function generator to output a 500–Hz, +5 dBm, CW signal.

   Note: The lower the function generator output level, the narrower the displayed pulse on the analyzer CRT. If the function generator frequency setting is decreased to 1 Hz or lower, it may be necessary to increase the function generator output to +10 dBm to display an adequate signal on the analyzer CRT.

3. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [SPAN] [1] [0] [MHz]
   [FREQUENCY] [5] [0] [0] [MHz]

4. Connect the equipment as shown in Figure 1–1. If your analyzer has Option 001 (75–ohm RF input), connect the 75–ohm side of the minimum loss adapter to the 75–ohm cable, connect the other end of the 75–ohm cable to the RF input of analyzer, and connect the 50–ohm cable from the signal generator to the 50–ohm side of the minimum loss adapter.

5. Make sure the test signal is displayed on the spectrum analyzer CRT. Press the following analyzer keys:
   PEAK SEARCH [MKR →CF]
   SPAN 0 Hz
   SWEEP BW [RES BW] 3 0 kHz
   [VID BW] 3 0 kHz
   TRIG [VIDEO]

6. Set the signal generator AM switch to the PULSE position.

7. Press the following analyzer keys:
   SWEEP BW [SWEEP TIME] 2 0 ms
   TRIG [SINGLE SWEEP]
   MKR [MARKER NORMAL]

8. Set the marker to the first full time pulse from the left edge of the analyzer CRT. Press the MKR [MARKER DELTA] keys. Using the PEAK SEARCH [NEXT PK RIGHT] keys, place the movable marker on the eighth time pulse to the right (i.e. the last full time pulse on the right side of the CRT). Read the time indication from the marker delta readout. The time measured should be from 14 to 18 ms maximum. Record the test result on a copy of the test record.

9. Repeat steps 7 and 8 for each of the seven remaining settings given in Table 1–3. Record the associated test results on a copy of the test record.

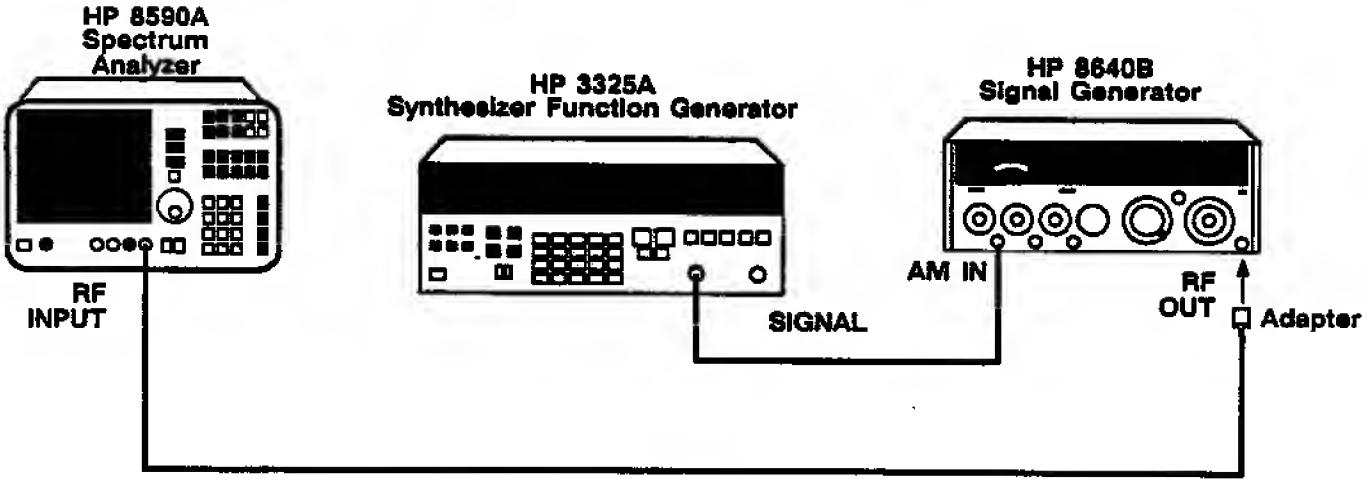


Figure 1–1. Sweep Time Accuracy Setup

Table 1–3. Sweep Time Accuracy Settings

8590A Sweep Time	3325A Frequency	Time Pulses Measured on CRT	
		Min.	Max.
20 ms	500 Hz	14.0 ms	18.0 ms
50 ms	200 Hz	35.0 ms	45.0 ms
100 ms	100 Hz	70.0 ms	90.0 ms
500 ms	20 Hz	350.0 ms	450.0 ms
1 s	10 Hz	700.0 ms	900.0 ms
10 s	1 Hz	7.0 s	9.0 s
50 s	0.2 Hz	35.0 s	45.0 s
100 s	0.1 Hz	70.0 s	90.0 s

Noise Sideband Test

A 500 MHz, CW signal is applied to the analyzer RF input. The signal sidebands are examined for noise amplitude and unwanted responses.

Specification

Noise sideband levels: <-65 dB down and >30 kHz offset from CW signal with 1 kHz resolution and 30 Hz video bandwidth.

Equipment

Signal Generator	HP 8640B
BNC Cable, 120 cm (48 in)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75 ohm to 50 ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75 ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure

1. Set the signal generator to output the 500 MHz, -20 dBm, CW signal. Set the AM and FM controls OFF, and the RF control ON.

2. Connect the equipment as shown in Figure 1-2. If your analyzer has Option 001 (75 ohm RF input), connect the 75 ohm side of the minimum loss adapter to the 75 ohm cable, connect the other end of the 75 ohm cable to the RF input of the analyzer, and connect the 50 ohm cable from the signal generator to the 50 ohm side of the minimum loss adapter.

3. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [FREQUENCY] [5] [0] [0] [MHz]
   [SPAN] [3] [0] [0] [MHz] 10
   [PEAK SEARCH]
   ~~[MKR] [MARKER NORMAL]~~ MKR→ [MARKER → RL]
   [SIGNAL TRACK]
   [SPAN] [3] [0] [0] [MHz] 300 KHz
   [SWEEP BW] [RES BW] [1] [kHz]
   [VID BW] [3] [0] [Hz]
   [TRIG]
   [SINGLE SWEEP]
   [PEAK SEARCH] MARKER DELTA 30 KHz (-30 KHz) ~~MARKER NORMAL~~
   ~~[MKR]~~ [MARKER NORMAL]
   ~~Move MKR Δ to highest point = one division to either side of the 500 MHz signal.~~
   ~~MKR Δ reading should be > 65 dBc.~~
   Record the MARKER reading on Pg 1-31 in the Performance Test Record (1 of 2)

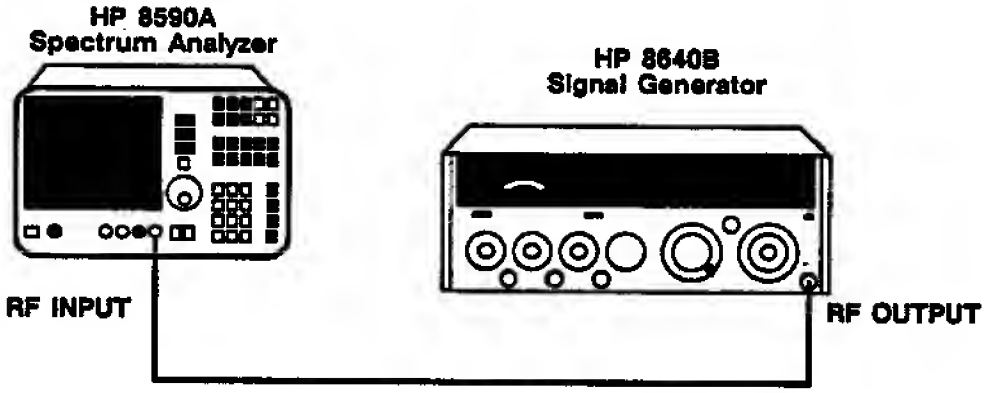


Figure 1–2. Noise Sideband Test Setup

Spurious Response Test

This test is performed in two parts. The first test part measures second harmonic distortion; the second test measures third-order intermodulation distortion.

To test second harmonic distortion a 300-MHz, CW signal is passed through a 10-dB attenuator and 300-MHz low-pass filter to the analyzer RF input. The low-pass filter ensures that harmonics measured are those generated by the analyzer, and not those of the signal generator. The distortion products are measured using the analyzer display (CRT).

For the third-order intermodulation distortion test, two signals are input to the analyzer. The distortion products are measured using the analyzer display (CRT).

Specification

Second Harmonic Distortion (for –45 dBm total power at mixer)
- < –70 dBc for frequencies >5 MHz
- < –60 dBc for frequencies ≤5 MHz

Third Order Intermodulation Distortion
- < –70 dBc for input signals greater than 5 MHz (input signals must be –30 dBm at the input mixer and greater than 50 kHz apart)
- < –60 dBc for 100 kHz to 5 MHz input signals

Equipment

Signal Generator (2 required)	HP 8640B
Attenuator, 10 dB (2 required)	HP 8491A
Low Pass Filter, 300-MHz	Telenic TLP 300-4AB
Directional Bridge, 100-MHz	HP 8721A
Adapter, Type N(m) to BNC(f)(2 required)	HP 1250-0780
BNC Cable 120 cm (48 in) (2 required)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure - Second Harmonic Distortion

1. Set the signal generator to output a 300-MHz, –45 dBm, CW signal. Set the AM and FM controls OFF, and the RF control ON.

2. Connect the equipment as shown in Figure 1-3. If your analyzer has Option 001 (75-ohm RF input), connect the 75-ohm side of the minimum loss adapter to the 75-ohm cable, connect the other end of the 75-ohm cable to the RF input of analyzer, and connect the 50-ohm cable from the low-pass filter to the 50-ohm side of the minimum loss adapter.

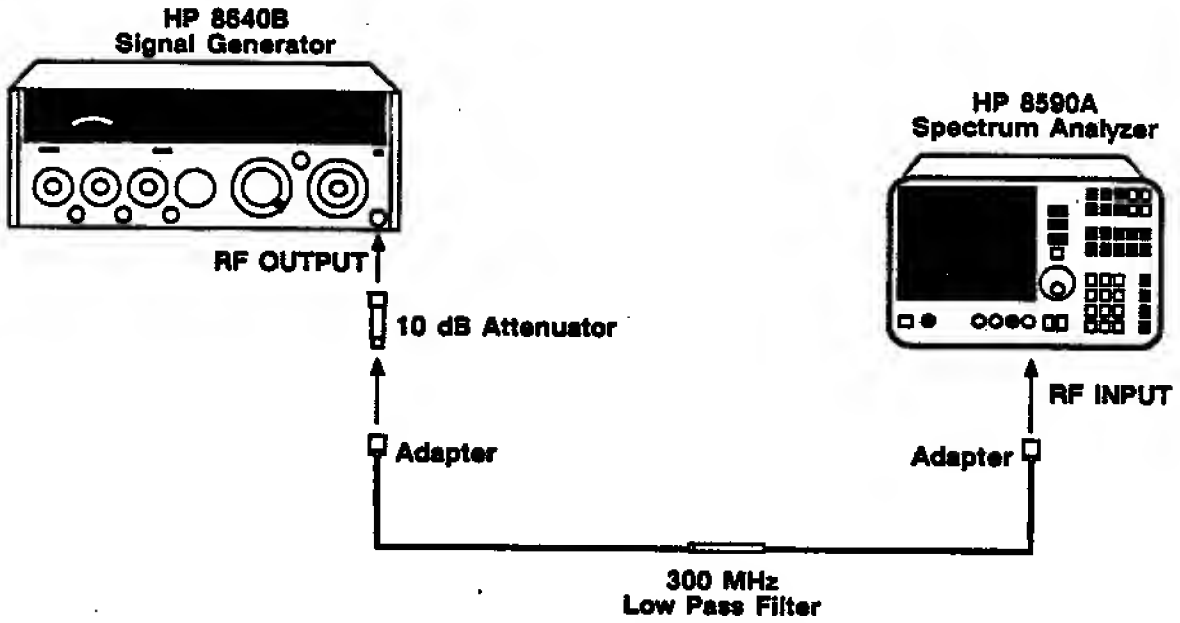


Figure 1-3. Spurious Response—Second Harmonic Distortion Test Setup

3. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [FREQUENCY] [3] [0] [0] [MHz]
   [SPAN] [3] [MHz]
   [PEAK SEARCH] [MARKER →CF]
   [SWEEP BW] [RES BW] [1] [kHz]
   [VID BW] [3] [0] [0] [Hz]
   [AMPLITUDE] [4] [0] [-dBm]
   [ATTEN] [0] [dB]
   [DISPLAY] [DISPLAY LINE] [1] [0] [5] [-dBm]
   [MKR →] [MARKER → STEP]
   [FREQUENCY]

4. Press the analyzer UP arrow key to step to the second harmonic. The second harmonic, which is at 600 MHz, should be below the display line.

5. Set the signal generator to output a 2-MHz, –45 dBm, CW signal.

6. Press the following analyzer keys:
   [FREQUENCY] [CENTER FREQ] [2] [MHz]
   [SPAN] [3] [MHz]
   [PEAK SEARCH] [MARKER →CF]
   [MKR →] [MARKER → STEP]
   [FREQUENCY]

7. Press the analyzer UP arrow key to step to the second harmonic. Set the displayed center frequency by pressing:
[FREQUENCY] [3] [MHz]
The second harmonic, at 4 MHz, should be below the display line.

Test Procedure – Third-Order Intermodulation Distortion

1. Set two signal generators so each outputs a 30-MHz, -20 dBm, CW signal. Set the AM and FM controls OFF and the RF controls ON.

2. Connect the equipment as shown in Figure 1-4. If your analyzer has Option 001 (75-ohm RF input), connect the 75-ohm side of the minimum loss adapter to the 75-ohm cable, connect the other end of the 75-ohm cable to the RF input of the analyzer, and connect the 50-ohm side of the minimum loss adapter to the Directional Bridge.

3. Press the following analyzer keys:
[PRESET] (wait until preset is complete)
[FREQUENCY] [3] [0] [MHz]
[SPAN] [5] [0] [0] [kHz]
[SWEEP BW] [RES BW] [3] [0] [kHz]
[AMPLITUDE] [ATTEN] [0] [dB]
[AMPLITUDE] [3] [0] [-dBm]

4. Adjust the frequency of both signal generators until signals are two divisions apart and centered on the analyzer display (CRT). Adjust generator output levels to -30 dBm, as displayed on the analyzer. Refer to the example display shown in Figure 1-5.

5. Press the following analyzer keys:
[SWEEP BW] [RES BW] [3] [kHz]
[VID BW] [3] [0] [0] [Hz]
[DISPLAY] [DISPLAY LINE] [1] [0] [0] [-dBm]

6. Referring to Figure 1-5 and the analyzer display, locate the third-order distortion products, which are approximately three divisions on either side of the signal generator fundamentals. The third-order distortion products ($2f_2 - f_1$ or $2f_1 - f_2$) must have an amplitude of less than -70 dBc.

   Note: If the intermodulation products can't be located, increase generator output levels by 10 dB, as shown on the CRT. After the products have been identified, reduce the generator output levels to -30 dBm. The third-order distortion products should disappear on the analyzer display.

7. Although second–order intermodulation distortion products are not included in the analyzer electrical specifications, you can verify them at this point. Press the following analyzer keys:
   FREQUENCY 1 MHz
   SWEEP BW [RES BW] 3 kHz

8. Referring to Figure 1–5, locate the second–order distortion products ($f_2 - f_1$), which are near the left side of the analyzer display. The second–order intermodulation products should be more than –70 dBc.

9. Press the following analyzer keys:
   FREQUENCY 6 0 MHz
   SWEEP BW [RES BW] 3 0 kHz

10. Check for a second–order distortion product between $f_1 + f_2$ signals. The product should be more than –70 dBc.

    Note: You can temporarily increase generator output levels by 10 dBm to help identify the second–order intermodulation responses between $f_1 + f_2$.

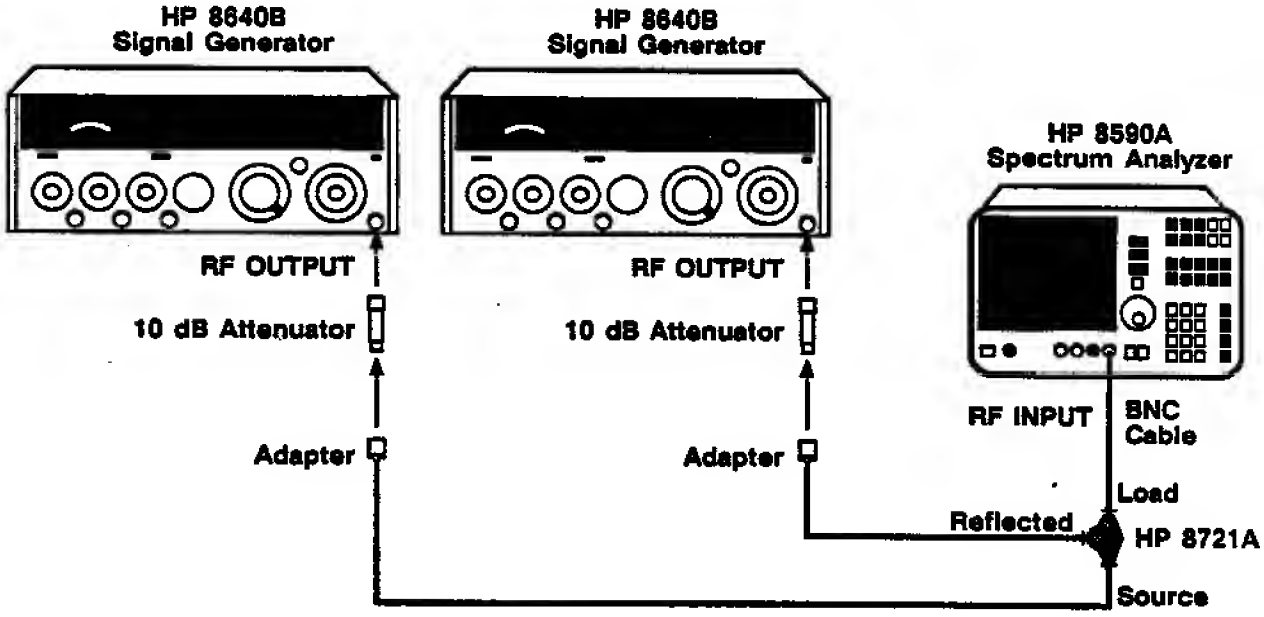


Figure 1–4. Spurious Response—Third–order Intermodulation Distortion Test Setup

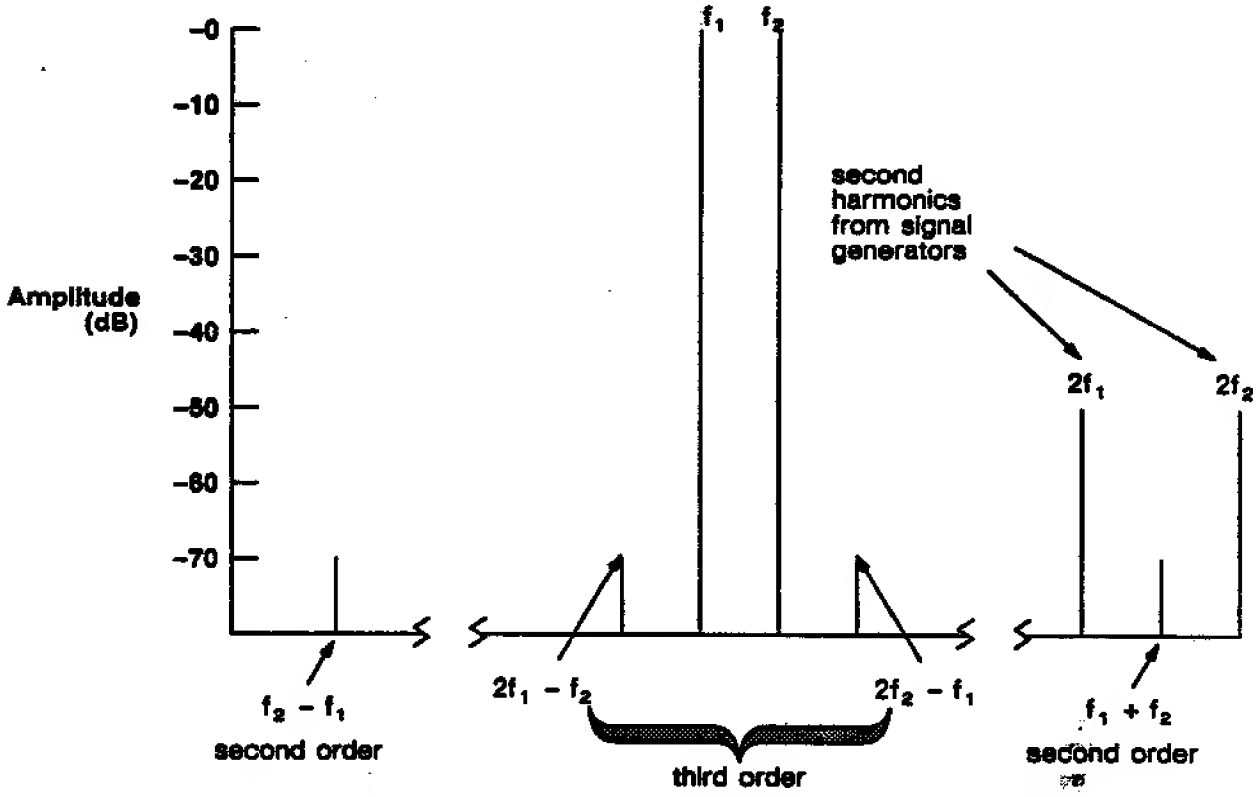


Figure 1–5. Spurious Response—Intermodulation Distortion Products

Residual Response Test

Residual response is checked by terminating the RF input of the analyzer, setting input attenuation to 0 dB, and measuring any residuals across the instrument's input frequency range. The analyzer CRT is used to make the measurements.

Specification

Residual Responses:

< –95 dBm with 0–dB input attenuation and no signal present at input.

Equipment

50–ohm Termination ..... HP 11593A

Equipment for Option 001

75–ohm Termination ..... HP 11652–60010

Test Procedure

Note: The following procedure requires approximately 30 minutes to complete with the frequency step size and span given.

1. Connect the 50–ohm termination to the analyzer RF input. If your analyzer has Option 001 (75–ohm RF input), connect the 75–ohm termination to the RF input instead.
2. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [FREQUENCY] [2] [5] [MHz]
   [SPAN] [5] [0] [MHz]
   [AMPLITUDE] [6] [0] [–dBm]
   [ATTEN] [0] [dB]
   [SWEEP BW] [RES BW] [3] [kHz]
   [VID BW] [1] [kHz]
   [DISPLAY] [DISPLAY LINE] [9] [5] [–dBm]
   [FREQUENCY] [CF STEP SIZE] [4] [5] [MHz]
3. Press analyzer [TRIG] and [SINGLE SWEEP] keys, and wait for sweep completion. Look for any residual responses at or above the display line on the analyzer CRT. If a residual is suspected, press the [SINGLE SWEEP] key again to determine if the response persists. A residual will persist on repeated sweeps, but a noise peak will not. Any residual responses must be at or below the display line.
4. Press the analyzer UP arrow key to step to the next higher center frequency, which is 45 MHz above the last setting. Repeat Step 3.
5. Repeat Steps 3 and 4 until the complete analyzer frequency range has been evaluated (i.e., until you reach the maximum frequency of 1.510 GHz). This requires 33 additional frequency steps. There should be no residual responses at or above the display line at frequencies below 1500 MHz.

Reference Level Accuracy Test

A 30-MHz CW signal is passed through a 10-dB step attenuator to the analyzer RF input. Analyzer logarithmic IF gain is adjusted by setting the displayed log scale reference level to correspond to the attenuation value selected on the step attenuator. The difference between the displayed signal level on the CRT log scale and the attenuator setting is used to determine the accuracy of the selected reference level.

Specification

< ±1.75 db for +30 to −120 dBm range (0- to 60-db attenuation)
< ±1.25 dB for 0 to −120 dBm range (10-dB attenuation) at any fixed frequency
< ±0.5 dB for 0 to −59 dBm range (10-dB attenuation) at any fixed frequency

Equipment

Signal Generator	HP 8640B
Step Attenuator (calibrated at 30 MHz)	HP 355D-H82
Adapter, BNC(f) to BNC(m)	HP 1250-1288 0216
Adapter, Type N(m) to BNC(f)	HP 1250-0780
BNC Cable, 20 cm (9 in)	HP 10502A
BNC Cable, 120 cm (48 in)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure

1. Set the signal generator to output a 30-MHz, −10 dBm, CW signal. Set the AM and FM controls OFF and RF control ON.

2. Set step attenuator to 0 dB of attenuation.

3. Connect the equipment as shown in Figure 1-6. If your analyzer has Option 001 (75-ohm RF input), connect the 75-ohm side of the minimum loss adapter to the 75-ohm cable, connect the other end of the 75-ohm cable to the RF input of the analyzer, and connect the 50-ohm cable from the step attenuator to the 50-ohm side of the minimum loss adapter.

4. Press the following analyzer keys:
   PRESET (wait until preset is complete)
   FREQUENCY 3 0 MHz
   SPAN 1 0 MHz
   PEAK SEARCH
   MKR [MARKER NORMAL]
   SIGNAL TRACK
   SPAN 5 0 kHz
   SWEEP BW [RES BW] 1 kHz
   [VID BW] 3 0 Hz
   AMPLITUDE 1 0 -dBm
   [ATTEN] 0 dB
   [LOG dB/DIV] 1 dB

5. Locate the input signal on the analyzer display. Adjust the generator output level until displayed signal trace on CRT is one graticule division down from the reference level (i.e., –11 dBm).

6. For each spectrum analyzer reference level and step attenuator setting given in Table 1–4, measure the deviation from one division below reference level using the analyzer log scale display. Record this deviation on a copy of the test record, taking into account the step attenuator calibration accuracy. Analyzer reference level is set by pressing the AMPLITUDE key, and then specifying the desired level (e.g., 1 0 -dBm for –10 dBm, or 1 0 dBm for +10 dBm).

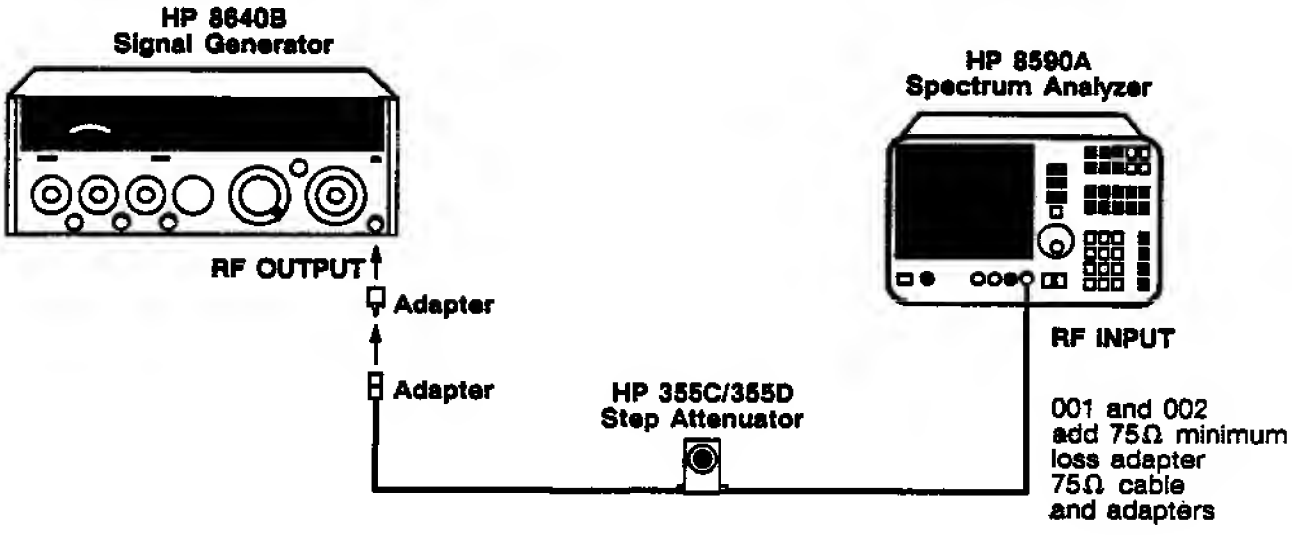


Figure 1–6. Reference Level Accuracy Test Setup

Table 1–4. Reference Level Accuracy Settings

REFERENCE LEVEL Setting (dBm)	Step Attenuator Setting (dB)
–10	0
–20	10
–30	20
–40	30
–50	40
–60	50
–70	60
–80	70
–90	80
–100	90

Attenuations > reference level settings are positive (+). Attenuations < reference level settings are negative (–). For example, 9.99 dB calibration for a 10–dB attenuator setting represents an error of –0.01 dB.

Scale Fidelity Test

This test is performed in two parts. The first part measures log scale fidelity; the second part checks linear scale fidelity. Both procedures use the same test method.

A 30-MHz, CW signal is passed through a 10-dB step attenuator to the analyzer RF input. The generator output level is adjusted to place the signal peak at the selected analyzer reference level. The signal amplitude is then reduced using the step attenuator. The scale fidelity figure is determined by calculating the error between the actual displayed and theoretical amplitude levels. The calculations are performed using the analyzer marker amplitude difference function and the selected attenuation value.

Specification

Log Incremental Accuracy
< ±0.1 dB/dB change over 70-dB range
Log Maximum Cumulative Error
±0.75 dB maximum over -60 dB range from reference level
±1.0 dB maximum over -70 dB range from reference level
Linear Accuracy
< ±3% of refernce level setting

Equipment

Signal Generator	HP 8640B
10-dB Step Attenuator (calibrated at 30 MHz)	HP 355D-H82
1-dB Step Attenuator (calibrated at 30 MHz)	HP 355C-H80
Adapter, BNC(f) to BNC(m)	HP 1250-1288
Adapter, Type N(m) to BNC(f)	HP 1250-0780
BNC Cable, 20 cm (9 in)	HP 10502A
BNC Cable, 120 cm (48 in)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure - Log Scale Fidelity

1. Set the signal generator to output a 30-MHz, 0-dBm, CW signal. Set the Counter control to INT ON, AM and FM controls OFF, and RF control ON.

2. Set the 10-dB step attenuator to 0 dB.

Table 1-5. Log Scale Fidelity Test Settings

Attenuator Setting (dB)	Minimum Amplitude (dB)	Maximum Amplitude (dB)
0	0	0
10	9.25	10.75
20	19.25	20.75
30	29.25	30.75
40	39.25	40.75
50	49.25	50.75
60	59.25	60.75
70	69.00	71.00

Table 1-6. Linear Scale Fidelity Test Settings

Attenuator Setting (dB)	Minimum Amplitude (mV)	Maximum Value (mV)
0	-223.6	-223.6
6	105.11	118.49
12	49.21	62.59

Frequency Drift Test

A 300 MHz, CW signal is applied to the analyzer RF input. After centering the signal on the analyzer display (CRT) for five minutes, the marker delta function of the analyzer is used to determine frequency drift over a five-minute period. The spectrum analyzer must be warmed up for a minimum of two hours prior to running this test.

Specification

Frequency drift:

< 50 kHz/five minutes after two-hour warmup and five minutes after setting center frequency

Equipment

Signal Generator	HP 8640B
BNC Cable 120 cm (48 in)	HP 10503A

Additional Equipment for Option 001

Minimum-Loss Adapter, 75 ohm to 50 ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure

Note: Be sure the unit is warmed up as described in specifications before performing the frequency drift test. This is needed to ensure an accurate evaluation of instrument operation and calibration.

1. Set the signal generator to output a 300 MHz, -10 dBm, CW signal. Set the AM and FM controls OFF, RF control ON, and Counter Mode to LOCK.

2. Connect equipment as shown in Figure 1-8. If your analyzer has Option 001 (75 ohm RF input), connect the 75 ohm side of minimum loss adapter to the 75 ohm cable, connect the other end of the 75 ohm cable to the RF input of the analyzer, and connect the 50 ohm cable from the signal generator to the 50 ohm side of the minimum-loss adapter.

3. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [FREQUENCY] [3] [0] [0] [MHz]
   [SPAN] [1] [0] [MHz]
   [PEAK SEARCH]
   [SIGNAL TRACK]
   [SPAN] [1] [0] [0] [kHz]

4. Wait 5 minutes, then press the following analyzer keys:
   PEAK SEARCH [MARKER DELTA]
   Wait 5 minutes, accurately timing the period using a timepiece. Press:
   PEAK SEARCH
   Read the marker delta frequency. Drift should not exceed 50 kHz plus a span accuracy of ±0.3 kHz per graticule division.

   Note: drift contribution provided by the signal generator is negligible, provided the critical specifications in recommended test equipment (Table 1-2) are satisfied.

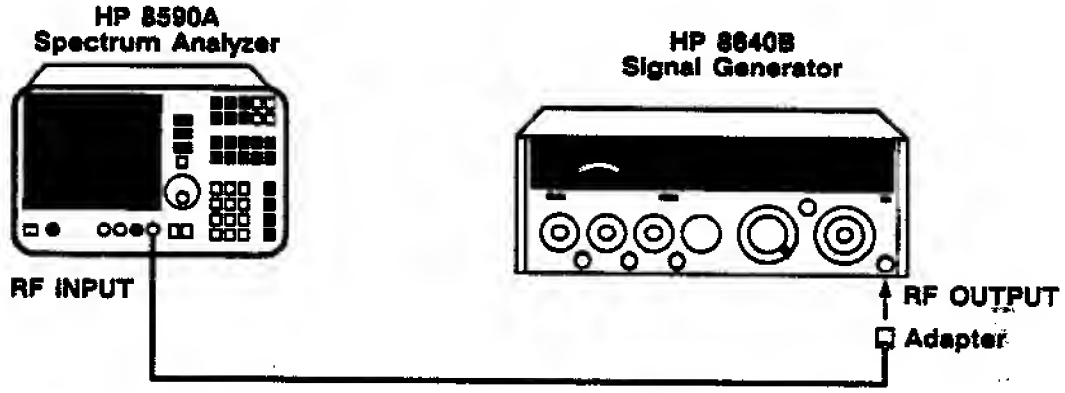


Figure 1-8. Frequency Drift Test Setup

Resolution Bandwidth Switching Test

In this test, the analyzer calibration (CAL Output) signal is applied to the RF input. The deviation in displayed peak signal amplitude for each IF resolution bandwidth filter is measured using the peak search function.

Specification

Resolution Bandwith Switching (Amplitude Variation)
< ±0.25 dB for 3-kHz to 3-MHz range

Equipment

BNC Cable 120 cm (48 in) ..... HP 10503A

Equipment for Option 001

BNC Cable, 30 cm (12 in), 75-ohm ..... HP 11652-60012

Test Procedure

1. Connect the BNC cable from the CAL output to the RF input of the analyzer.

2. Press the following analyzer keys:
   [PRESET] (wait until preset is complete)
   [FREQUENCY] [3] [0] [0] [MHz]
   [SPAN] [1] [0] [MHz]
   [PEAK SEARCH]
   [SIGNAL TRACK]
   [SPAN] [5] [0] [kHz]
   [SWEEP BW] [RES BW] [3] [kHz]
   [VID BW] [1] [kHz]
   [AMPLITUDE] [2] [0] [-dBm]
   [LOG dB/DIV] [1] [dB]

3. Note the marker amplitude displayed on the analyzer. This is the reference level that will be used to evaluate amplitude deviation in the following steps. Record the amplitude reference measurement on a copy of the test record given in Table 1-7.

4. Press the following analyzer keys to select the next resolution bandwidth indicated in Table 1-7:
   [SWEEP BW] [RES BW] [1] [0] [kHz]
   Read the marker amplitude deviation from the reference level that was determined in Step 3, and record this in Table 1-7. The maximum allowable marker deviation is ± 0.25 dB.

5. Repeat Step 4 for each of the remaining resolution bandwidths and spans indicated in Table 1–7. The maximum marker deviation allowed is ± 0.25 dB.

Table 1–7. Resolution Bandwidth Switching Test Record

	Resolution Bandwidth	Span	Allowable Deviation
-19.8	3 kHz	50 kHz	—
-19.8	10 kHz	50 kHz	± 0.25 dB
-19.9	30 kHz	500 kHz	± 0.25 dB
-19.8	100 kHz	500 kHz	± 0.25 dB
-19.8	300 kHz	5 MHz	± 0.25 dB
-19.8	1 MHz	5 MHz	± 0.25 dB
-19.8	3 MHz	10 MHz	± 0.25 dB

Gain Compression Test

A signal generator and a synthesizer are used to input two signals to the analyzer input mixer via a directional bridge. The synthesizer is set to output an 80-MHz, -24 dBm, CW signal through the directional bridge, which has a 6-dB loss. This signal must be at least 20 dB below the analyzer's compression-level threshold, which is -10 dBm. The signal generator is set to output a 100-MHz, 0-dBm, CW signal at the directional bridge's load connector.

First, the signal generator and synthesizer output levels are calibrated using a power meter. The synthesizer output is then connected to the bridge and measured by the analyzer to establish a reference level for the test. Next, the signal generator is connected, and the synthesizer is disconnected, for the compression-level evaluation. The analyzer's marker delta function is used to determine the resulting compression level.

Specification

Gain Compression

RF Input <1 dB for -10 dBm total power at input mixer
Internal IF <1 dB when signals are higher than reference level and total power at input mixer is -20 dBm

Equipment

Synthesizer	HP 3335A
Signal Generator	HP 8640B
Directional Bridge	HP 8721A
Power Meter	HP 436A
Power Sensor	HP 8484A
BNC Cable 120 cm (48 in) (4 required)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Test Procedure

1. Set the signal generator to output a 100-MHz, CW signal. Connect the signal generator to the REFLECTED power connector of the directional bridge, as shown in Figure 1-9. Use the power meter or power sensor to set the signal generator output level to 0 dBm, measured at the LOAD connector of the directional bridge. Temporarily disconnect the signal generator from the directional bridge. Terminate the REFLECTED port with a 50-ohm load.

2. Set the synthesizer to output an 80-MHz, CW signal. Connect the BNC cable to the synthesizer RF output. Use a power meter and power sensor to set the synthesizer output level to -24 dBm at the free end of the BNC cable. Connect the synthesizer to the SOURCE connector of the directional bridge, as shown in Figure 1-9.

3. Connect the analyzer to the LOAD connector of the directional bridge, as shown in Figure 1-9. If your analyzer has Option 001 (75-ohm RF input), connect the 75-ohm side of the minimum loss adapter to the 75-ohm cable, connect the other end of the 75-ohm cable to the RF input of the analyzer, and connect the 50-ohm cable from the directional bridge to the 50-ohm side of the minimum loss adapter.

4. Press the following analyzer keys:
   PRESET (wait until preset is complete)
   FREQUENCY 8 0 MHz
   SPAN 1 0 MHz
   PEAK SEARCH
   SIGNAL TRACK
   SWEEP BW [RES BW] 3 MHz
   [VID BW] 3 0 0 Hz
   AMPLITUDE [LOG dB/DIV] 5 -dB
   MKR [MARKER DELTA]

5. Reconnect the signal generator to the REFLECTED connector of the directional bridge. Note the marker delta readout on the analyzer display. The marker delta amplitude change should not exceed 1 dB.

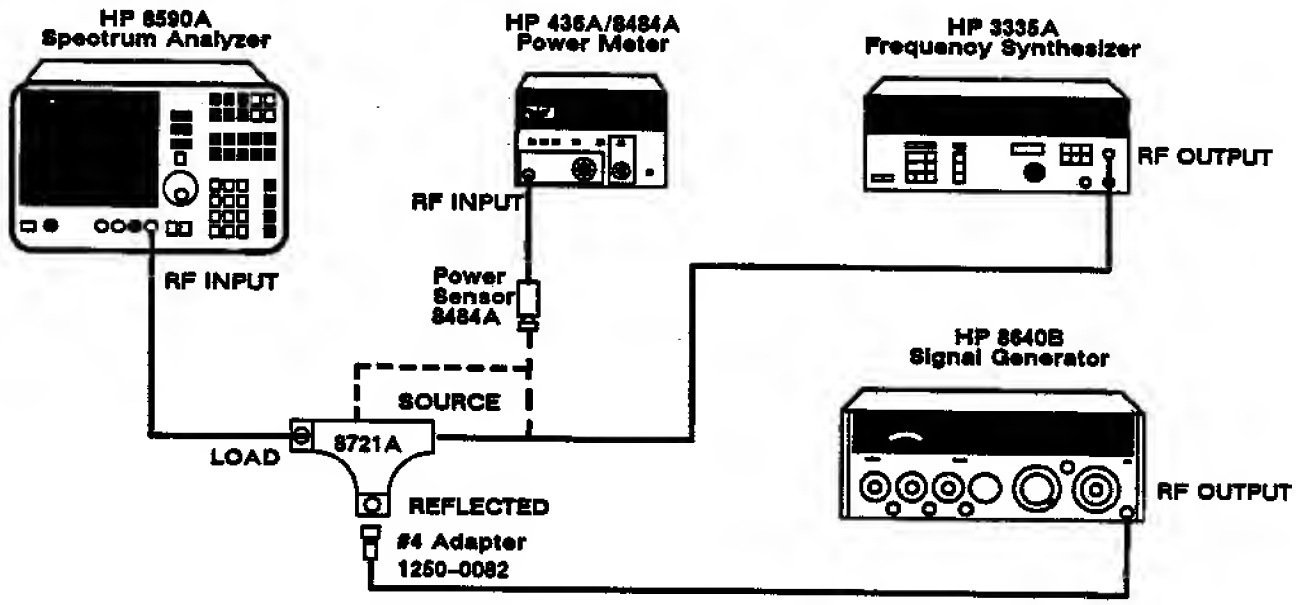


Figure 1–9. Gain Compression Test Setup

Performance Verification Test Record (1 of 2)

Hewlett-Packard Company
HP Model 8590A
Spectrum Analyzer 10 kHz to 1.5 GHz

Tested by:_____
Date:_____
Serial No._____

Test Description	Results		
	Min.	Actual	Max.
Sweep Time Accuracy			
20 ms	14.0 ms	_____	18.0 ms
50 ms	35.0 ms	_____	45.0 ms
100 ms	70.0 ms	_____	90.0 ms
500 ms	350.0 ms	_____	450.0 ms
1 s	700.0 ms	_____	900.0 ms
10 s	7.0 s	_____	9.0 s
50 s	35.0 s	_____	45.0 s
100 s	70.0 s	_____	90.0 s
Noise Sidebands			
>–65 dBc down		_____	
Spurious Response			
2nd harmonic <–105 dBm		_____	
3rd–order distortion <–70 dBc		_____	
(2nd–order products >–70 dBc)		_____	
Residual Response			
Residuals ≤ –95 dBm		_____	
Reference Level Accuracy		_____	
–10 dBm		Reference level	
–20 dBm		_____ dB	
–30 dBm		_____ dB	
–40 dBm		_____ dB	
–50 dBm		_____ dB	
–60 dBm		_____ dB	
–70 dBm		_____ dB	
–80 dBm		_____ dB	
–90 dBm		_____ dB	

* For information only. This measurement not covered by HP 8590A specifications.

Performance Verification Test Record (2 of 2)

Hewlett-Packard Company
HP Model 8590A
Spectrum Analyzer 10 kHz to 1.5 GHz

Tested by:_____
Date:_____
Serial No._____

Test Description	Results		
	Min.	Actual	Max.
Log Scale Fidelity			
0 dB	0 dB	Reference level	0 dB
10 dB	9.5 dB	_____dB	10.5 dB
20 dB	19.5 dB	_____dB	20.5 dB
30 dB	29.5 dB	_____dB	30.5 dB
40 dB	39.5 dB	_____dB	40.5 dB
50 dB	49.5 dB	_____dB	50.5 dB
60 dB	59.5 dB	_____dB	60.5 dB
70 dB	69.2 dB	_____dB	70.8 dB
Linear Scale Fidelity			
0 dB	-223.6 mV	Reference level	-223.6 mV
6 dB	105.11 mV	_____	111.49 mV
12 dB	49.21 mV	_____	62.59 mV
Frequency Drift**			
<50 kHz per 5 minutes		_____	
Resolution Bandwidth Switching		_____	
3 kHz		_____Ref.	
10 kHz		_____ dB	
30 kHz		_____ dB	
100 kHz		_____ dB	
300 kHz		_____ dB	
1 MHz		_____ dB	
3 MHz		_____ dB	
Gain Compression			
<1.0 dB		_____	

** 2-hour minimum warmup required before running test.

CHAPTER 2

ADJUSTMENTS

Introduction

The procedures in this chapter adjust the analyzer's electrical performance to the specifications of Table 1-1 in the Installation Manual (HP Part Number 08590-90003).

To fully calibrate the analyzer, all seven adjustments listed in Table 2-1 must be completed in the order shown. If one or more analyzer assemblies have been replaced or repaired, the relevant adjustment procedures should be done before performance testing the instrument. The internal CAL FREQ, CAL AMPTD, and CAL YTO DELAY must also be run.

All adjustments require access to the interior of the analyzer.

WARNING

The analyzer contains potentially hazardous voltages. Refer to the safety symbols provided on the analyzer and the general safety instructions in this manual before operating the unit with the cover removed. Ensure that safety instructions are strictly followed. Failure to do so can result in severe or fatal injury.

Table 2-1. HP 8590A Spectrum Analyzer Adjustments

Adjustment Name	Affected Assembly
Second Converter LO and Bandpass Adjustment	Second Converter A5
Third Converter LO and CAL Output Adjustment	Third Converter A9
Second IF Bandpass Amplifier and Bandpass Filter Adjustment	Second IF A10
Step Gain Assembly RF Gain Adjustment	Step Gain A12
Step Amplifier Gain Adjustment	Step Gain A12
Log Amplifier Log and Linear Adjustment	Log Amplifier A14
Crystal and LC Bandwidth Filter Adjustments	Bandwidth Filter No. 1 A11 and Bandwidth Filter No. 2 A13

Before You Start

There are three things you must do *before* attempting the adjustment procedures in this chapter:

1. Remove the analyzer's dust cover. Familiarize yourself with the safety symbols marked on the analyzer and the general safety instructions and symbol definitions given in the front of this manual.

2. Plug the analyzer into the ac power mains. Switch the analyzer on and let it warm up. If the analyzer has been stored at least 2 hours in an area where the ambient temperature is within the specified operating range (0 to 55°C), a 30-minute warmup is required. If the storage temperature was less than 0°C, warm up the analyzer for at least 2 hours.

3. Read the rest of this section before you start any of the adjustment procedures.

Test Equipment You'll Need

Table 1-2 lists the recommended test equipment needed to maintain and adjust the analyzer. Each adjustment procedure includes a list of the equipment and accessories required for that adjustment. Although Hewlett-Packard equipment is recommended, equivalent equipment may be used provided it meets the critical specifications shown in Table 1-2.

Adjustment Tools

For adjustments requiring a nonmetallic tuning tool, use fiber tuning tool, HP Part Number 8170-0033. Never try to force an adjustment control in the analyzer. This is especially critical when tuning slug-tuned inductors and variable capacitors.

Abnormal Indications During Adjustment

If the indications received during calibration do not agree with the normal conditions given in the adjustment procedures, a fault exists in your analyzer. The fault should be repaired *before* proceeding with any further adjustments. Refer to the troubleshooting and repair information in Chapter 5.

Periodically Verifying Calibration

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year. To fully verify analyzer operation and calibration, you should run the entire set of performance tests indicated in Chapter 1. When test results show proper operation and calibration, no adjustments will be needed. However, if test results indicate the instrument doesn't meet specifications, the cause should be determined and rectified. Refer to Chapter 5 before attempting recalibration.

Second Converter LO and Bandpass Adjustments

The second converter LO is adjusted for 1728.7 MHz, and the bandpass filter is adjusted for a 2050-MHz bandpass.

Equipment

Frequency Counter	HP 5342A
Comb Generator	HP 8406A
Test Cable, SMC(f) to BNC(m)	HP 11592-60001
Adapter, Type N(m) to BNC(f)	HP 1250-0780
Adapter, SMC(f) to SMC(f)	HP 1250-1113
Adapter, SMC(m) to SMC(m)	HP 1250-0827
Adapter, SMC(m) to BNC(m)	HP 1250-0831
BNC Cable, 120 cm (48 in)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Adjustment Procedure

1. Set equipment as follows:

   Frequency Counter:

Range	1750 MHz
Sample Rate	Full CCW

   Comb Generator:

Comb Frequency	100 MHz
Interpolation Amplitude	OFF

2. Press the following analyzer keys:
   PRESET (wait for preset to complete)
   FREQUENCY 3 0 0 MHz
   SPAN 1 0 0 MHz
   AMPLITUDE 2 0 -dBm
   [ATTEN] 0 dB

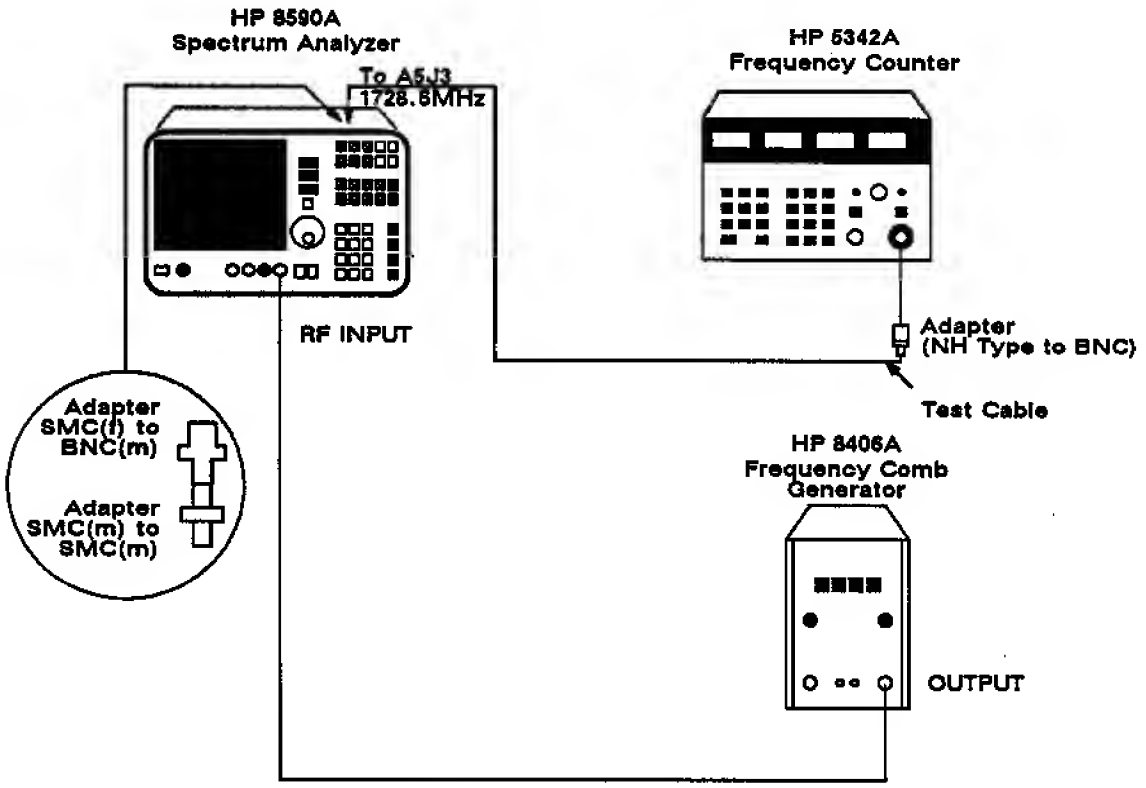


Figure 2–1. Second Converter LO and Bandpass Adjustment

3. Connect the equipment as shown in Figure 2–1. Connect the counter to the second LO test jack A5J3 at the top of Second Converter Assembly A5. Connect the comb generator to the analyzer RF input.

   If your analyzer has Option 001 (75–ohm RF input), connect the 75–ohm side of the minimum loss adapter to the 75–ohm cable, connect the other end of the 75–ohm cable to the RF input of the analyzer, and connect the 50–ohm cable from the comb generator to the 50–ohm side of the minimum loss adapter.

4. Adjust the second LO frequency adjustment A5C4 for 1728.7 MHz. Use an Allen wrench through the center of the drilled–out 5/16–inch nut driver to enable the nut to be tightened without shifting frequency.

5. Set the comb generator for a 100–MHz comb.

6. Center the 300–MHz comb tooth with the RPG as necessary. Press the following analyzer keys:
   SPAN 2 0 MHz
   SWEEP/BW [RES BW] 3 0 0 kHz

7. Loosen the lock nuts on A5C1 and A5C2. Very carefully turn their tuning screws clockwise until they are bottomed on the cavity.

8. Turn the A5C1 and A5C2 tuning screws one turn counterclockwise and lightly tighten their lock nuts.

9. Loosen the lock nut on A5C3 and adjust the A5C3 tuning screw for peak signal on the CRT. Press (AMPLITUDE) [LINEAR] for best resolution while making final adjustments. It may also be necessary to increase amplitude on the CRT to see the signal.

10. Adjust the A5C1 for peak signal on the CRT. Reduce the REF level as necessary to keep a signal on the CRT by pressing (AMPLITUDE) and then the up arrow key (or use the numeric keypad).

11. Adjust the A5C2 for maximum signal on the CRT. Again it may be necessary to reduce the REF level to keep the signal on the CRT.

12. As tuning is completed, carefully tighten the lock nuts on the A5C1, A5C2, and A5C3 so that the signal level does not change on the CRT.

13. Adjust the A5L2 second mixer match adjustment for maximum signal on the CRT.

14. Check the second LO frequency for 1728.7. If the frequency error is greater than ±0.5 MHz, repeat the procedure, beginning with Step 4.

Third Converter LO and CAL Output Adjustment

The third converter LO power is adjusted for -20 dBm ± 1.0 dB CAL output. The third LO frequency is checked for 299.9 MHz ± 300 kHz.

Equipment

Signal Generator	HP 8640B
Low Pass Filter, 300-MHz	Telonic TLP 300-4AB
Power Meter	HP 436A
Power Sensor	HP 8482A
Adapter, Type N(m) to BNC(f) (2 required)	HP 1250-0780
Adapter, Type N(f) to BNC(m)	HP 1250-0077
BNC Cable, 120 cm (48 in) (4 required)	HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter, 75- to 50-ohm	HP 08558-60031
BNC Cable, 30 cm (12 in), 75-ohm	HP 11652-60012
Adapter, SMA(f) to SMA(f)	HP 1250-1158
Adapter, BNC(f) to SMA(m)	HP 1250-1200

Adjustment Procedure

1. Set the signal generator as follows:

Output Level	-20 dBm
Frequency	299.9 MHz
AM and FM	OFF
RF	ON
Counter Mode	INT

2. Press the following analyzer keys:
   PRESET (wait for preset to complete)
   FREQUENCY 2 9 9 . 9 MHz
   SPAN 5 0 MHz
   SWEEP/BW [RES BW] 1 MHz
   AMPLITUDE 1 0 -dBm
   [LINEAR]

3. Connect the equipment as shown in Figure 2-2. Connect the analyzer CAL output to the RF input jack.

4. Press FREQUENCY and use the RPG to center the 299.9-MHz Third LO signal on the CRT.

5. Adjust the A9L1 third converter FREQ adjustment for maximum signal amplitude.

6. Tune the signal generator to the frequency of the third converter LO (299.9 MHz ± 300 kHz).

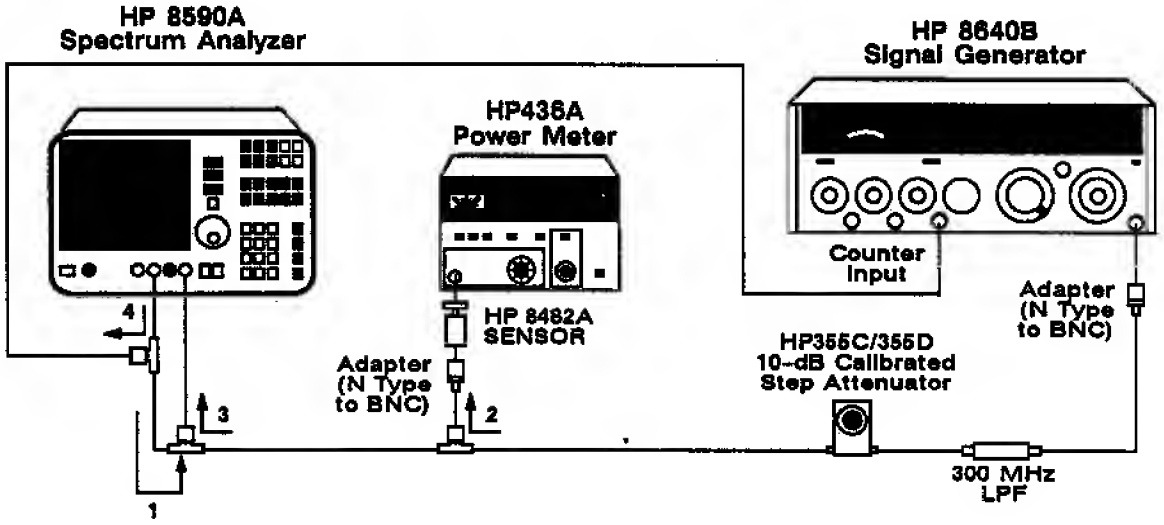


Figure 2–2. Third Converter LO and CAL Output Adjustment

7. Connect the signal generator through a 300–MHz LPF to the calibrated step attenuator. Set the step attenuator to 20 dB. Connect the power meter input to the other side of the attenuator, as shown in Figure 2–2.

8. Set the signal generator output level for –20 dBm ± 1.0 dB on the power meter. Leave the signal generator set at this level.

9. Connect the reference signal from Step 8 (attenuator output) to the analyzer RF input connector.

10. Set the signal from the signal generator to a convenient reference level on the analyzer display by pressing the analyzer [AMPLITUDE] key and using the RPG.

11. Adjust the A9R4 third converter calibrator level adjustment to the reference level (signal amplitude set in Step 10).

12. Connect the analyzer CAL output to the counter input of the signal generator. Set the signal generator counter mode to EXT EXPAND X10. The third LO frequency should read 299.9 MHz ± 300 kHz.

Second IF Bandpass Amplifier and Bandpass Filter Adjustment

The second IF 321.3-MHz bandpass amplifier and 321.3-MHz bandpass filter are adjusted for maximum signal amplitude.

Equipment

Signal Generator ..... HP 8640B
Adapter, Type N(f) to BNC(m) ..... HP 1250-0077
Test Cable, SMC(f) to BNC(m) ..... HP 11592-60001

Adjustment Procedure

1. Press the following analyzer keys:
   PRESET (wait for preset to complete)
   FREQUENCY 3 2 0 MHz
   SPAN 1 0 0 MHz
   SWEEP/BW [RES BW] 1 MHz
   AMPLITUDE 1 0 -dBm
   [ATTEN] 0 dB

2. Set the signal generator to output a 321.3-MHz, -35 dBm, CW signal.

3. Remove the W15 blue cable from the second IF BPF input, A10J1. Connect the signal generator through the test cable to A10J1, as shown in Figure 2-3.

4. Adjust bandpass filter capacitors A10C1, A10C2, and A10C3 on the second IF assembly fully counter-clockwise. Press AMPLITUDE and adjust the RPG as necessary for an on-screen display.

5. Adjust the A10C1 for maximum signal amplitude. Make final adjustments by pressing the analyzer AMPLITUDE [LINEAR] keys. Use the AMPLITUDE setting to keep the signal on the top half of display.

6. Adjust the A10C3 for maximum signal amplitude. There may be a double peak; tune past the first peak to the second peak. The displayed signal will peak, fall off, and then peak again.

7. Repeat Steps 5 and 6, adjusting the A10C1 and A10C3 for maximum amplitude.

8. Adjust the A10C2 for maximum signal amplitude. There may be a double peak; tune to the second peak. Reduce the signal generator input level to keep the signal on the display.

Note: The value of the A10L2 is set at the factory. Its adjustment has very little effect on the signal or performance of the analyzer. In turn, A10L2 doesn't require adjustment since the position of its core is not critical.

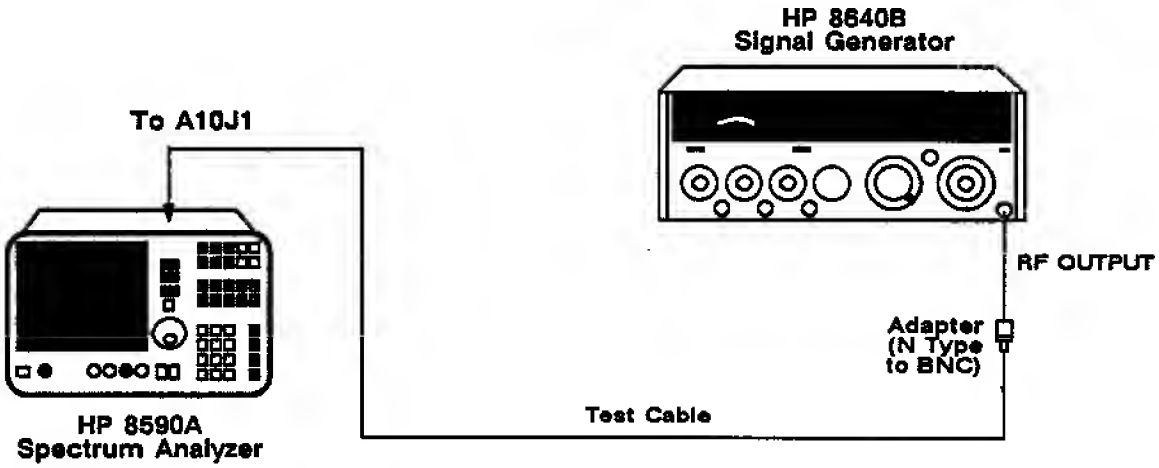


Figure 2–3. Second IF Bandpass and Bandpass Filter Adjustment

Step Gain Assembly IF Gain Adjustment

The IF gain (sensitivity) of the step gain assembly is adjusted by injecting a 21.4 MHz signal at A15XA9. The Third Converter Assembly is removed and replaced with a special extender board, used to inject the 21.4 MHz signal generator output.

Equipment

Signal Generator	HP 8640B
Power Meter	HP 436A
Power Sensor	HP 8482A
Adapter, Type N(m) to BNC(f)	HP 1250-0780
Adapter, Type N(f) to BNC(m)	HP 1250-0077
Adapter, BNC(f) to alligator clips (short leads)	HP 8120-1292
BNC Cable, 120 cm (48 in) (2 required)	HP 10503A
Special Extender Board (w/51.1 ohm resistor)	HP 08505-60109 w/HP 0757-0394

Note: To make the special extender board, solder a 51.1 ohm resistor from pin 1 (GND) to pin 5 of a standard extender board, HP Part Number 08508-60109. Leave the resistor leads long enough for easy connection of clip leads.

Adjustment Procedure

1. Press the following analyzer keys:
   PRESET
   SPAN 0 Hz
   SWEEP/BW [RES BW] 3 0 KHz
   CAL [CORRECT OFF/on] OFF
   MKR [MARKER NORMAL]

2. Connect the output of the HP 8640B through adapters to the HP 8482A power sensor. Adjust the power for -11 dBm.

3. Remove the A9 assembly and insert the special extender board. Connect the output of the HP 8640A across the 51.1 ohm resistor on the extender board using the BNC-to-clip-lead adapter. The red lead (center conductor) should be connected to extender board pin 5, and the black lead should be connected to pin 1. Ensure that the cable is run straight up at least 10 inches from the extender board to avoid pickup of unwanted signals.

4. Set the signal generator frequency for peak amplitude on the CRT display

5. Adjust the A12R4 gain (overall IF gain) adjustment for marker level of 0 dBm.

6. Remove the special extender board and replace the A9 assembly. Perform CAL AMP routine.

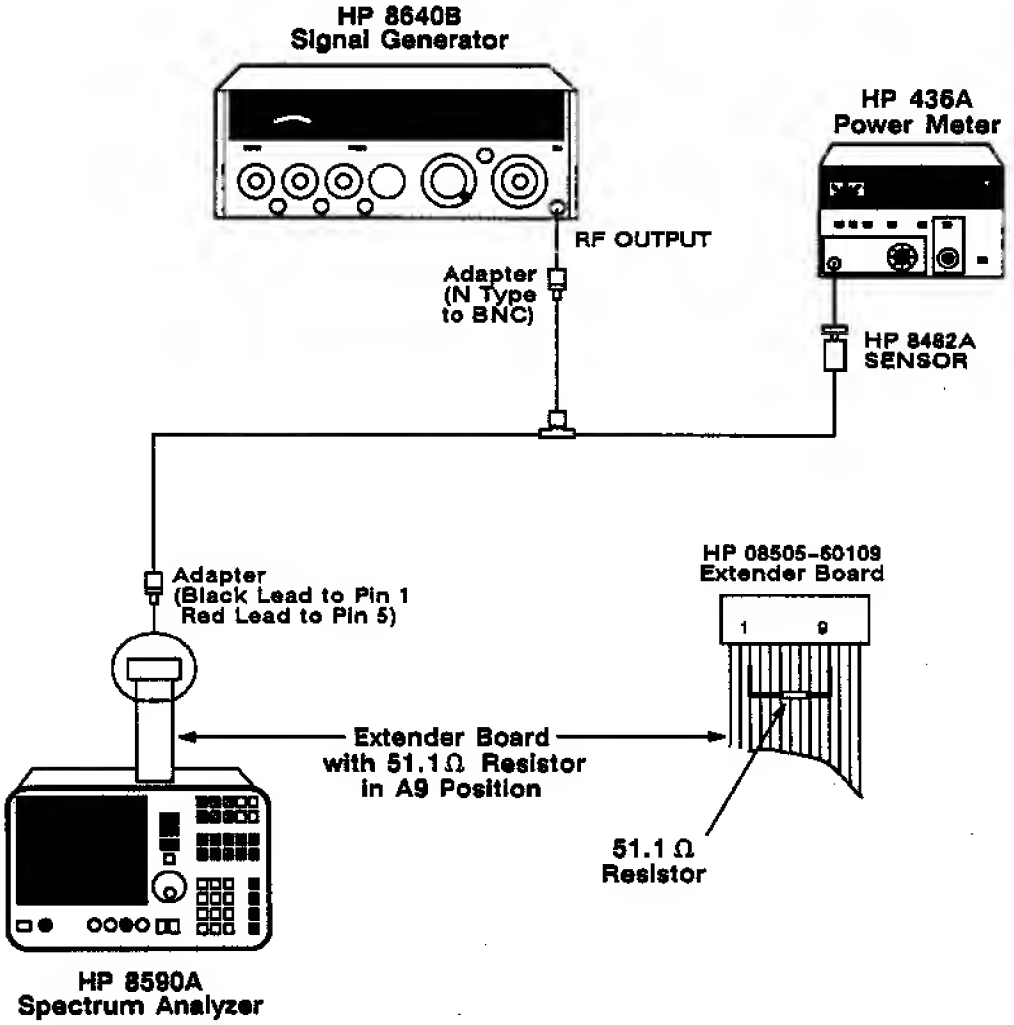


Figure 2-4. Step Gain Assembly RF Gain Adjustment Test Setup

Step Amplifier Gain Adjustments

Amplifier gain steps of 0 dB, 20 dB, and 40 dB are adjusted.

Equipment

Signal Generator	HP 8640B
Power Meter	HP 436A
Power Sensor	HP 8482A
10-dB Step Attenuator	HP 355D-H82
Adapter, Type N(m) to BNC(f)	HP 1250-0780
Test Cable, SMC(f) to BNC(m)	HP 11592-60001
Adapter, SMC(m) to SMC(m)	HP 1250-0827
BNC Cable, 120 cm (48 in) (2 required)	HP 10503A

Adjustment Procedure

Press the following analyzer keys:
PRESET (wait for preset to complete)
FREQUENCY 3 0 0 MHz
PEAK SEARCH [NEXT PEAK]
SIGNAL TRACK
SPAN 1 0 MHz
SWEEP/BW [RES BW] 1 MHz
SWEEP/BW [VID BW] 1 MHz
AMPLITUDE [LOG dB/DIV] 1 dB/DIV

Connect the equipment as shown in Figure 2-5. Set the signal generator to output a 321.3-MHz, -14 dBm, CW signal. Connect the signal generator to one side of a 10-dB step attenuator.

3. Disconnect cable W16 from the A9J1. Connect the other side of the 10-dB step attenuator to the A9J1 using the test cable.

4. Tune the signal generator frequency for peak amplitude on the display (near 321.3 MHz). Adjust the signal generator output level for a signal level of -10 dBm on the analyzer display.

5. Set the step attenuator to 10 dB and press the following analyzer keys:
AMPLITUDE 1 0 -dBm.

6. Adjust the A12R19 10 dB adjustment for a signal level of -20 dBm on the analyzer display.

7. Set the step attenuator to 20 dB and press the following analyzer keys:
AMPLITUDE 2 0 -dBm.

8. Adjust the A12R2 20 dB adjustment for a signal level of –30 dBm on the analyzer display.

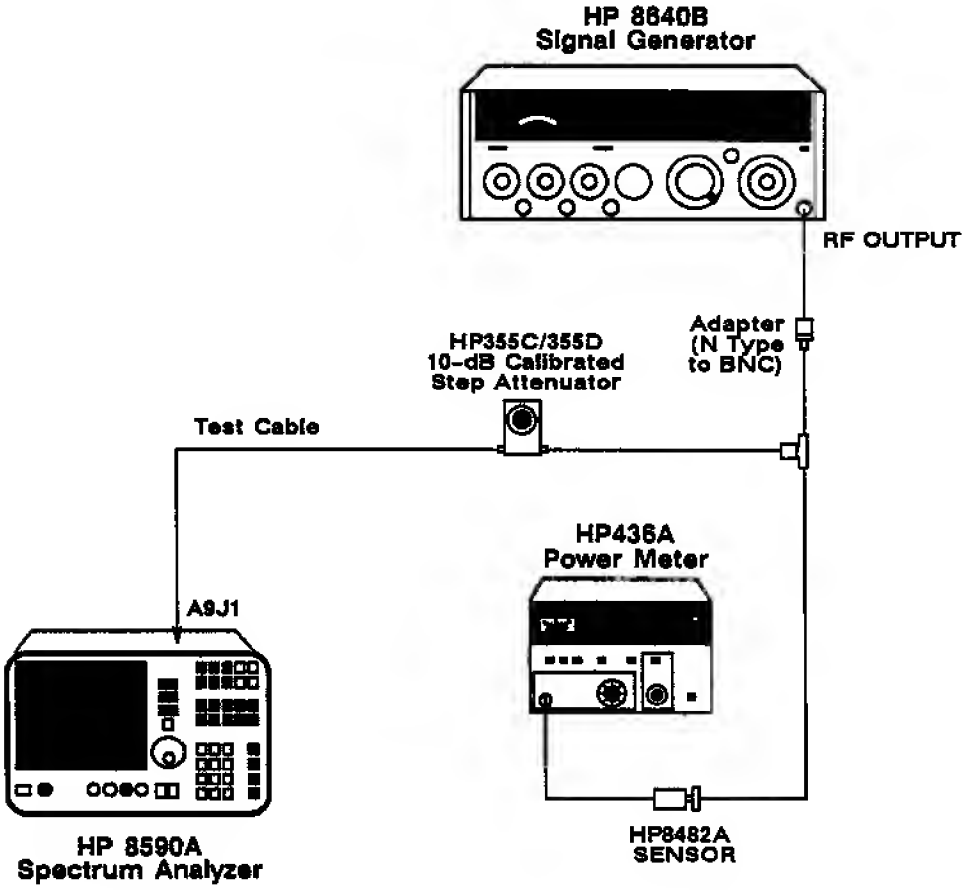


Figure 2–5. Step Amplifier Gain Adjustment Test Setup

9. Set the step attenuator to 40 dB and press the following analyzer keys: [AMPLITUDE] [4] [0] [–dBm].

   Note: Increasing the amount of video filtering might help reduce noise. Set the video filter so noise is reduced but the signal amplitude remains unchanged.

10. Adjust the A12R1 40–dB adjustment for a signal level of –50 dBm on the analyzer display.

11. Check the REF level settings from 0 to –50 dBm, as shown in Table 2–2.

12. Disconnect the step attenuator and reconnect cable W16 to the A9J1.

Table 2–2. Reference Level Control Check

Reference level (dBm)	Attenuator Setting (dB)	Reference Deviation
0	0	Ref. _____ mV
–10	10	± 0.5 Division
–20	20	± 0.5 Division
–30	30	± 0.5 Division
–40	40	± 0.5 Division
–50	50	± 0.5 Division

Log Amplifier Log and Linear Adjustment

Step attenuators are used to change, in calibrated steps, the input signal level of the spectrum analyzer. The AUX VIDEO output on the rear panel is monitored, and adjustments are performed to calibrate the Log Amplifier Assembly A14.

Equipment

Signal Generator	HP 8640B
Digital Voltmeter	HP 3456A
10 dB Step Attenuator	HP 355D-H82
1 dB Step Attenuator	HP 355C-H80
Adapter, Type N(m) to BNC(f)	HP 1250-0780
Test Cable, SMC(f) to BNC(m)	HP 11592-60001
Cable Assembly, Banana Plug to Alligator Clip	HP 11102A
BNC Cable, 120 cm (48 in) (2 required)	HP 10503A
BNC Cable, 20 cm (9 in)	HP 10502A

Adjustment Procedure

1. Set the digital voltmeter as follows:

Range	10
Function	DC VOLTS
Trigger	INTERNAL
Math	OFF
Auto Cal	ON

2. Press the following analyzer keys:

PRESET
FREQUENCY (−) 2 0 0 1 Hz
CAL [CORRECT OFF] [MORE] [CAL FLATNESS] [STP GAIN ZERO]
TRACE A [CLEAR WRITE A]
SPAN 0 kHz
SWEEP/BW [RES BW] 1 0 kHz
AMPLITUDE 1 0 −dBm [LINEAR]

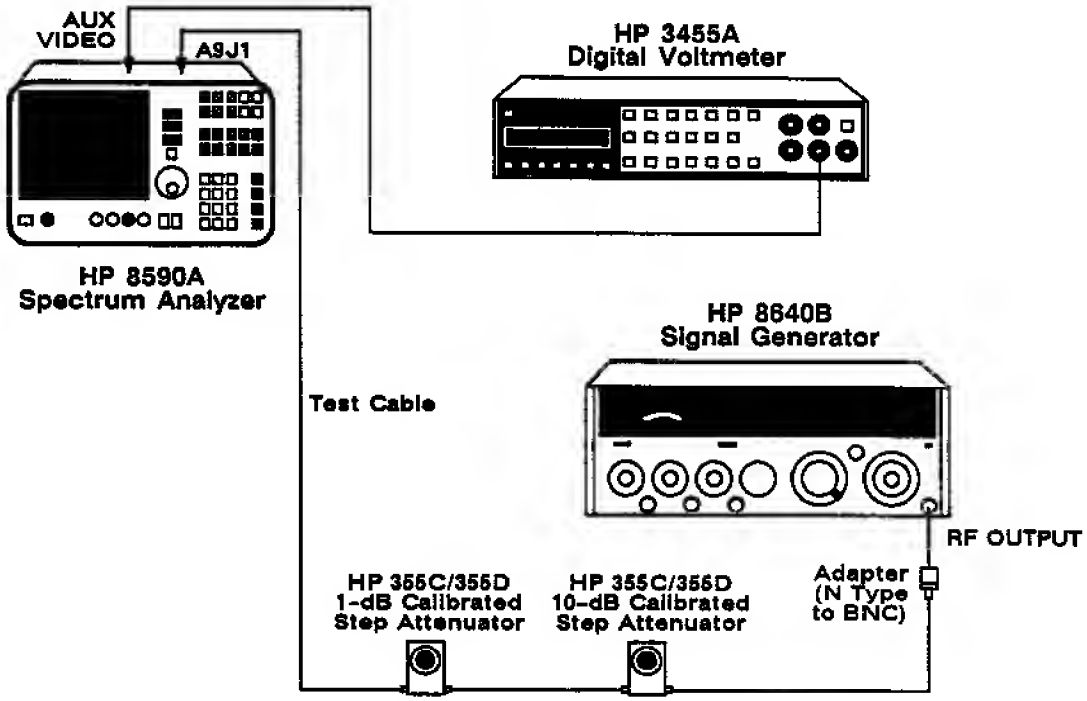


Figure 2-6. Log Amplifier Log and Linear Adjustment

3. Connect the equipment as shown in Figure 2-6. Set the 1-dB step attenuator to 10 dB. Set the signal generator frequency to 321.3 MHz and the output level to -13 dBm. Remove the W16 (red cable) from the A9J1. Connect the signal generator output through the step attenuators and the test cable to the A9J1.

4. Tune the signal generator frequency for maximum signal amplitude on the display, with the 10-dB step attenuator set to 0 dB. It may be necessary to reduce the signal generator output level slightly.

5. Disconnect the signal generator output from the step attenuator. Measure the offset at the AUX VIDEO output on the rear panel and record for later reference: _____ mV.

6. Connect the signal generator to the step attenuator and adjust the signal generator fine-tune control to peak the signal on the analyzer display.

7. Adjust the signal generator output level for DVM reading (± 1.0 mV) of 1000 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

8. Press the following analyzer keys:
[AMPLITUDE] [LOG dB/DIV] [1] [0] [dB/DIV].

9. Set the 10-dB step attenuator to 0 dB and adjust the A14R23 slope for a DVM reading (± 1 mV) of 1000 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

10. Set the 10 dB step attenuator to 60 dB and adjust the A14R10 offset for the DVM reading (±1 mV) of 250 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

11. Repeat Steps 9 and 10 until no further adjustment is necessary.

12. Set the 10 dB step attenuator to 30 dB and adjust the A14R23 slope for a DVM reading (±1 mV) of 625 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

13. Set the 10 dB attenuator to 0 dB and adjust the A14R69 -30 dB for a DVM (±1 mV) of 1000 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

14. Repeat Steps 12 and 13 until no further adjustment is necessary.

15. Set the 10 dB step attenuator to 10 dB and adjust the A14R23 slope for a DVM reading of 875 mV ±1 Mv plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

16. Set the 10 dB step attenuator to 0 dB and adjust the A14R39 -10 dB for a DVM reading (±1 mV) of 1000 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

17. Repeat Steps 15 and 16 until no further adjustment is necessary.

18. Repeat Steps 9 through 16 until the limits in Table 2-3 are met.

Table 2-3. Log Fidelity Check

Attenuator Setting (dB)	DVM Reading*
0	Ref: 1000 ±1 mV
10	875 ±3 mV
20	750 ±4 mV
30	625 ±4 mV
40	500 ±5 mV
50	375 ±6 mV
60	250 ±7 mV
70	125 ±8 mV
	* plus offset

Linear Output and Step Gain

19. Press the following analyzer keys:
    AMPLITUDE 5 0 −dBm
    [LINEAR]

20. Set the 10 dB step attenuator to 0 dB and adjust the A14R34 LIN for a DVM reading (±1 mV) of 1000 mV plus the offset recorded in Step 5, as measured at the AUX VIDEO output on the rear panel.

21. Make the adjustments indicated in Table 2-4.

Table 2-4. Linear Gain Adjustments.

Adjustment	Step (dB)	Reference (dBm)	DVM Reading*
A14R34	0	-50	Ref: 1000 ±1 mV
A14R33	10	-60	1000 ±5 mV
A14R30	20	-70	1000 ±5 mV
A14R27	30	-80	1000 ±5 mV
None	40	-90	1000 ±30 mV

*1000 mV plus offset from Step 5

Crystal and LC Bandwidth Filter Adjustments

The crystal and LC bandwidth filter circuits are adjusted for symmetry, center frequency, and peak amplitude. Checking the 3-dB bandwidths also verifies correct operation of the bandwidth control circuitry on Analog Interface Assembly A7.

Equipment

Crystal Shorts (3 required) ..... See Figure 2-7
BNC Cable, 120 cm (48 in) ..... HP 10503A

Additional Equipment for Option 001

BNC Cable, 30cm (12 in), 75-ohm ..... HP 11652-60012

Note: A crystal short (Figure 2-7) consists of a .01-µF capacitor (HP Part Number 0160-0161) and a 90.9-ohm resistor (HP Part Number 0757-0400) connected in series. Two square-terminal connectors (HP Part Number 0362-0265) are used to connect the crystal shorts across the test points.

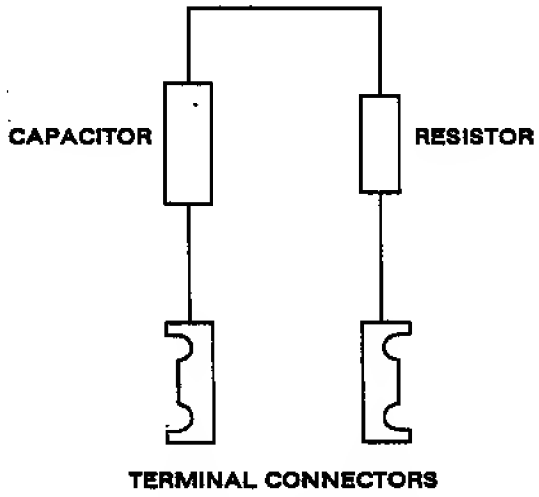


Figure 2-7. Crystal Short Configuration

Procedure

1. Press the following analyzer keys:
   PRESET (wait for preset to complete)
   FREQUENCY 3 0 0 MHz
   PEAK SEARCH [NEXT PK RIGHT]
   SIGNAL TRACK
   SPAN 2 MHz
   SWEEP/BW [RES BW] 1 MHz
   AMPLITUDE [ATTEN] 0 dB
   AMPLITUDE -1 0 -dBm
   MKR [MARKERS OFF]

Crystal Alignment

2. Connect the equipment as shown in Figure 2–8.

3. Press the menu 1 [3 dB points].

4. Check that the signal is 1 MHz ±200 kHz.

5. Press the following analyzer keys:
   MKR [MARKERS OFF]
   SPAN 5 0 kHz
   SWEEP/BW [RES BW] 1 0 kHz
   Press menu 1 [3 dB points]

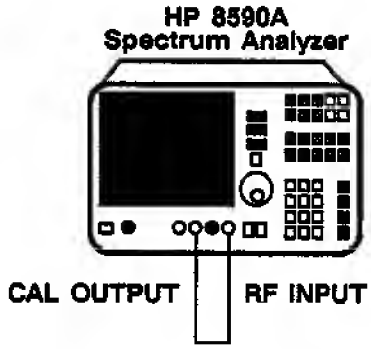


Figure 2–8. Crystal and LC Bandwidth Filter Adjustments

6. Check that the signal is 10 kHz ±2 kHz wide at the 3–dB points.

7. Press the following analyzer keys:
   MKR [MARKERS OFF]
   SPAN 2 0 0 kHz
   SWEEP/BW [RES BW] 3 0 kHz

8. Press the analyzer FREQUENCY key and use the RPG to center the signal.

9. Press the analyzer AMPLITUDE key and use the RPG to place the signal at the sixth graticule line.

Note: A nonmetallic tuning tool is required for adjustments on the A11 and A13 bandwidth filter assemblies.

10. Connect the crystal shorts (through cover access holes) across the following pairs of adjustment points: A13TP1/TP2, A11TP1/TP2, and A11TP4/TP5.

Note: Keep the crystal spike centered during adjustment. The SYM and CTR adjustments for each crystal interact.

11. Press FREQUENCY and use the RPG to center the bandpass spike (Figure 2–9) on the analyzer display.

12. Adjust the A13C54 CTR for minimum signal amplitude. Then adjust the A13C38 SYM and A13C54 CTR for a centered and symmetrical bandpass, as shown in Figure 2–9.

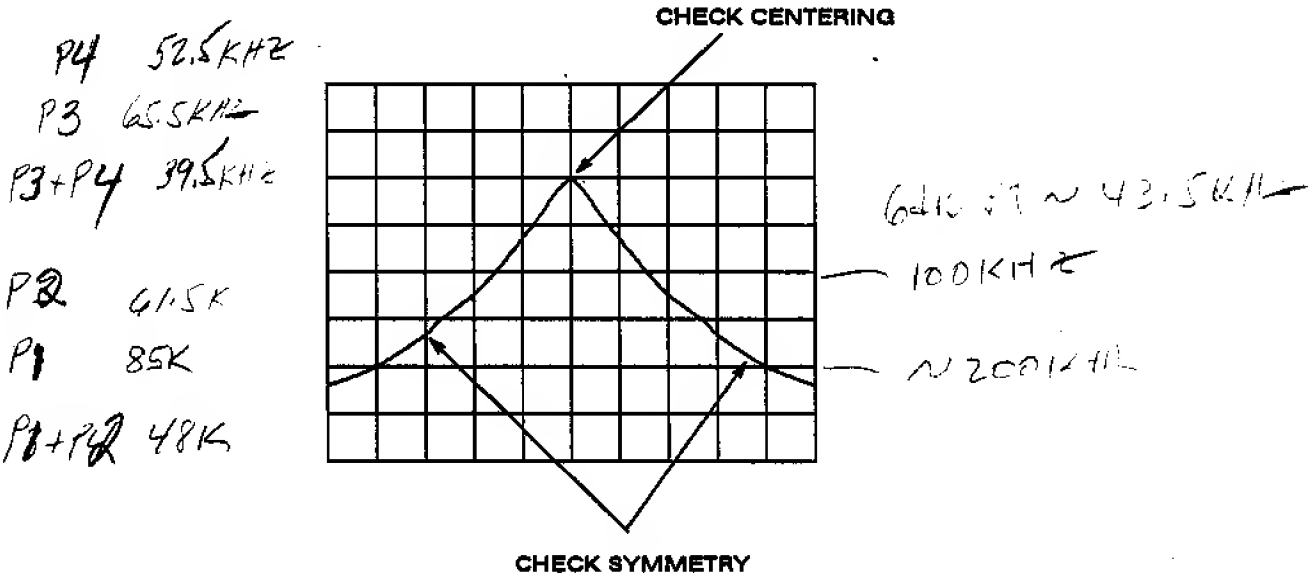


Figure 2–9. Adjusting Crystal Symmetry and Crystal Centering

13. Remove the crystal short from the A13TP1/TP2 and connect it across the A13TP4/TP5.

14. Adjust the A13C25 CTR for minimum signal amplitude. Then adjust the A13C15 SYM and A13C25 CTR for a centered and symmetrical bandpass.

15. Remove the crystal short from the A11TP4/TP5 and connect it across the A13TP1/TP2.

16. Adjust the A11C54 CTR for minimum signal amplitude. Then adjust the A11C38 SYM and A11C54 CTR for a centered and symmetrical bandpass.

17. Remove the crystal short from the A11TP1/TP2 and connect it across the A11TP4/TP5.

18. Adjust the A11C25 CTR minimum signal amplitude. Then adjust the A11C15 SYM and A11C25 CTR for a centered and symmetrical bandpass.

19. Remove the crystal shorts.

20. Press the following analyzer keys:
[SPAN] [5] [0] [kHz]
[SWEEP/BW] [RES BW] [3] [0] [kHz]
MARKERS OFF

21. Press the analyzer [FREQUENCY] key and use the RPG to center the signal on the display.

22. Press the [SWEEP/BW] [RES BW] keys and switch between 30-kHz and 10-kHz resolution bandwidths, and back, several times. Verify that the signal shift does not exceed 3 kHz (0.6 division). If the signal shift is out of tolerance, repeat Steps 11 through 24.

LC Alignment

23. Press the following analyzer keys:
[SWEEP/BW] [RES BW] [1] [0] [0] [kHz]
[SPAN] [1] [MHz]

Referring to the Analog Interface Assembly A7 schematic shown in Figure 5-15, jumper the BW7 line to +15 V.

Note: When Bandwidth Filter Assemblies A11 and A13 are installed with covers in place, midget copper alligator clips (HP Part Number 1400- 0483) can be used to short test points to the cover.

24. Perform preliminary LC filter adjustments as follows:

Note: It might be necessary to press the analyzer [AMPLITUDE] key to set the REF level to obtain an on-screen display during the following adjustment.

a. Remove the A13 cover and install A13 on an extender board.
b. Short the following adjustment points to ground: A13TP6, A11TP3, and A11TP6. This widens all but one pole of the LC filters.

c. Center the signal on the analyzer display using the FREQUENCY control key and the RPG. Adjust the A13C73 for minimum signal amplitude.
d. Disconnect the short from the A13TP6 and short the A13TP3 to ground.
e. Adjust the A13C74 for minimum signal amplitude.
f. Reinstall the A13 and its cover. Disconnect the short from the A11TP3. Remove the cover from Assembly A11 and install the A11 on the extender board.
g. Short the A13TP6 to ground.
h. Adjust the A11C73 for minimum signal amplitude.
i. Disconnect the short from A11TP6 and short the A11TP3 to ground.
j. Adjust the A11C74 for minimum signal amplitude.
k. Disconnect the shorts from the adjustment points and reinstall the A11 and its cover.

25. Short the A11TP3, A11TP6, and A13TP3 to ground. Press the following analyzer keys:
SWEEP/BW [RES BW] 1 0 0 kHz
SPAN 2 0 0 kHz

26. Center the signal on the analyzer display using the FREQUENCY key and the RPG. Adjust the A13C45 LC CTR for symmetrical bandpass on the display. Use the RPG to keep the crystal spike centered.

27. Move the short from the A13TP3 to the A13TP6. Leave the other shorts in place. Center the signal on the analyzer display with the RPG. Adjust the A13C23 LC CTR for symmetrical bandpass on the display, keeping the crystal spike centered.

28. Move the short from the A11TP6 to the A11TP3. Leave the other shorts in place. Center the signal on the display with the RPG. Adjust the A11C45 LC CTR for symmetrical bandpass on the display, keeping the crystal spike centered.

29. Move the short from the A11TP3 to the A11TP6. Leave the other shorts in place. Center the signal on the display with the RPG. Adjust the A11C23 LC CTR for symmetrical bandpass on the display, keeping the crystal spike centered.

30. Disconnect the shorts from the A11TP6, A13TP3, A13TP6, and from ground. Ground the BW7 control line at Analog Interface Assembly A7, connector J6, pin 2.

31. Press the following analyzer keys:
SWEEP/BW [RES BW] 3 0 kHz
SPAN 1 0 0 kHz

Press the FREQUENCY key and center the signal on the display using the RPG. Then press the following analyzer keys:
SWEEP/BW [RES BW] 1 0 0 kHz

Note where the signal crosses the center vertical graticule line on the analyzer display.

32. Adjust the A11C23, A11C45, A13C23, and A13C45 in succession, so that the amplitude of the signal is peaked where it crosses the center line on the display. Repeat Step 33 between adjustments, as necessary.

33. Repeat Steps 33 and 34 until the 30-kHz and 100-kHz bandwidths are centered with each other. If the signal shift between the 30-kHz and 100-kHz bandwidths is greater than 10 kHz (one division), repeat steps 25 through 34.

Bandwidth Amplitude

34. Press the following analyzer keys:
[SWEEP/BW] [RES BW] [1] [0] [0] [kHz]
[SPAN] [1] [MHz]

Referring to the Analog Interface Assembly A7 schematic shown in Figure 5-10, jumper the BW7 control line at connector J6, pin 2, to +15 Vdc. (A7J6 PIN 1)

35. Short the A11TP3, A11TP6, A13TP3, and A13TP6 to ground.

36. Press the following analyzer keys:
[SPAN] [2] [MHz]

ADJUST AMPLITUDE

37. ~~Center the signal~~ at seven divisions on the analyzer display using the [AMPLITUDE] key and the RPG.

38. Remove the shorts from the A13TP3 and A13TP6, and center the signal with the RPG. Adjust the A13R26 LC for a signal amplitude of seven divisions.

39. Remove the short from the A11TP3 and A11TP6. Adjust the A11R26 LC for a signal amplitude of seven divisions.

40. Repeat Steps 37 through 41 until no further adjustment is necessary.

41. Adjust the A11R31 and A13R31 XTL fully counterclockwise.

42. Press the following analyzer keys:
[SWEEP/BW] [RES BW] [1] [kHz]
[SPAN] [5] [0] [kHz]

Press the [FREQUENCY] key and center the signal with the RPG. Adjust the A11R31 XTL and A13R31 XTL equally for a signal amplitude of seven divisions. Each potentiometer should be adjusted to accomplish half the necessary increase in signal amplitude.

43. Remove the jumper from the BW7 line on Analog Interface Assembly A7.

44. Press the following analyzer keys:

SWEEP/BW [RES BW] 3 MHz
SPAN 5 MHz

Press the analyzer FREQUENCY key and use the RPG to center the signal on the display. Press the AMPLITUDE key and use the RPG to set the displayed amplitude of the signal to seven divisions.

45. Press the analyzer SWEEP/BW [RES BW] keys, and then step down from 3 MHz to 300 kHz using the down arrow key. Variation in signal amplitude should be less than ± 0.4 dB.

46. Press the following analyzer keys:
SWEEP/BW [RES BW] 1 0 0 kHz
SPAN 2 0 kHz

Press the analyzer SWEEP/BW [RES BW] keys, and then step down from 100 kHz to 1 kHz using the down arrow key. Variation in signal amplitude should no less than ± 0.7 dB from the seventh division display reference.

47. Repeat Steps 36 through 48 until the variation in signal amplitude is within limits.

3–dB Bandwidth Check

Center frequency, amplitude, and 3–dB bandwidths of the resolution BW filters are controlled by the processor through the A7 Analog Interface Assembly. The 3–dB bandwidths are not specified, but nominal tolerances are included for purposes of checking the BW's operation and ensuring correct operation of the built–in CAL routines.

Equipment

BNC Cable, 120 cm (48 in) (2 required) ..... HP 10503A

Additional Equipment for Option 001

BNC Cable, 30 cm (12 in), 75–ohm ..... HP 11652–60012

Adjustment Procedure

1. Connect the analyzer CAL output to the RF input.

2. Press the following analyzer keys:
   PRESET (wait for preset to complete)
   PEAK SEARCH [NEXT PK RIGHT] SIGNAL TRACK
   SPAN 5 MHz
   AMPLITUDE 1 0 -dBm
   SWEEP/BW [RES BW] 1 MHz
   [VID BW] 1 MHz

3. Press the following analyzer keys:
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 1 MHz ±200 kHz.

4. Press the following analyzer keys:
   SWEEP/BW [RES BW] 3 MHz
   SPAN 10 MHz
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 3 MHz ±600 kHz.

5. Press the following analyzer keys:
   SWEEP/BW [RES BW] 3 0 0 kHz
   SPAN 1 MHz
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 300 kHz ±60 kHz.

6. Press the following analyzer keys:
   SWEEP/BW [RES BW] 1 0 0 kHz
   SPAN 3 0 0 kHz
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 100 kHz ±20 kHz.

7. Press the following analyzer keys:
   SWEEP/BW [RES BW] 3 0 kHz
   SPAN 1 0 0 kHz
   TRACE A [VIEW A]
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 30 kHz ±6 kHz.

8. Press the following analyzer keys:
   SWEEP/BW [RES BW] 1 0 kHz
   SPAN 5 0 kHz
   TRACE A [VIEW A]
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 10 kHz ±2 kHz.

9. Press the following analyzer keys:
   SWEEP/BW [RES BW] 3 kHz
   SPAN 2 0 kHz
   TRACE A [VIEW A]
   menu 1 [3 dB POINTS]

   The marker Δ readout should be 3 kHz ±600 Hz.

10. Press the following analyzer keys:
    SWEEP/BW [RES BW] 1 kHz [VID BW] 1 kHz
    SPAN 1 0 kHz
    TRACE A [VIEW A]
    menu 1 [3 dB POINTS]

    The marker Δ readout should be 1 kHz ±200 Hz.

10. Frequency Response

Description

The frequency response (flatness) of the spectrum analyzer is measured with the corrections off. The source is adjusted to place the displayed signal at the analyzer center horizontal graticule line.

The flatness data is then entered into the spectrum analyzer using the SERVICE CAL functions. The error corrections are stored in battery-backed RAM on the A16 Processor/Video Assembly.

Option 001: The 50Ω system is characterized before starting the "Frequency Response" adjustment procedure.

Equipment

Test Equipment

Synthesized Sweeper	HP 8340A/B
Measuring Receiver (used as a power meter)	HP 8902A 436A OK
Frequency Synthesizer	HP 3335A
Power Sensor	HP 8482A
Power Splitter	HP 11667A

Adapters

Type N(f) to APC 3.5(m)	1250-1745
Type N(m) to Type N(m)	1250-1475

Cables

BNC, 122 cm (48 in.)	HP 10503A
Type N, 183 cm (72 in.)	HP 11500A

Additional equipment for Option 001

Power Meter	HP 436A
Power Sensor	HP 8483A
Cable, BNC, 120 cm (48 in) 75Ω	5062-6452
Adapter, Type N(f) 75Ω to Type N(m) 50Ω	1250-0597
Adapter, Type N(m) to BNC(m), 75Ω	1250-1533

Procedure for System Characterization (*Option 001 only*)

1. Zero and calibrate the HP 8902A and HP 8482A as described in the *HP 8902A Operation Manual.*
2. Zero and calibrate the HP 436A and the HP 8483A as described in the *HP 436A Operation Manual.*
3. Press INSTRUMENT PRESET on the HP 8340A/B. Set the HP 8340A/B controls as follows:

CW	~~41 MHz~~ 10 MHz
FREQ STEP	~~37 MHz~~ 50 MHz
POWER LEVEL	5 dBm

10. Frequency Response

4. Connect the equipment as shown in Figure 2-23.

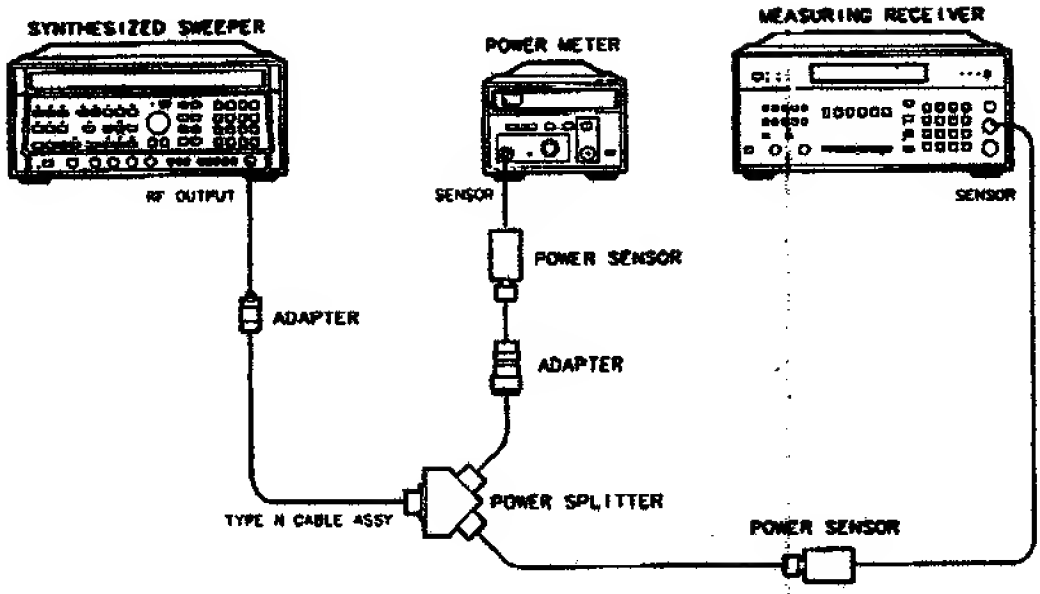


Figure 2-23. System Characterization Test Setup *(Option 001)*

5. Adjust the HP 8340A/B POWER LEVEL for a 0 dBm reading on the HP 8902A.
6. Record the HP 436A reading in Column 4 of Table 2-10, taking into account the cal factors of both the HP 8482A and the HP 8483A. Take readings at 10 & 50 MHz - Record
7. On the HP 8340A/B, press CW and STEP UP, to step through the remaining frequencies listed in Table 2-10.

   At each new frequency repeat steps 5 and 6 and enter each power sensor cal factor into the respective power meter.

Adjustment Procedure

1. Zero and calibrate the HP 8902A and HP 8482A in log mode as described in the *HP 8902A Operation Manual.*
2. Connect the equipment as shown in Figure 2-24.

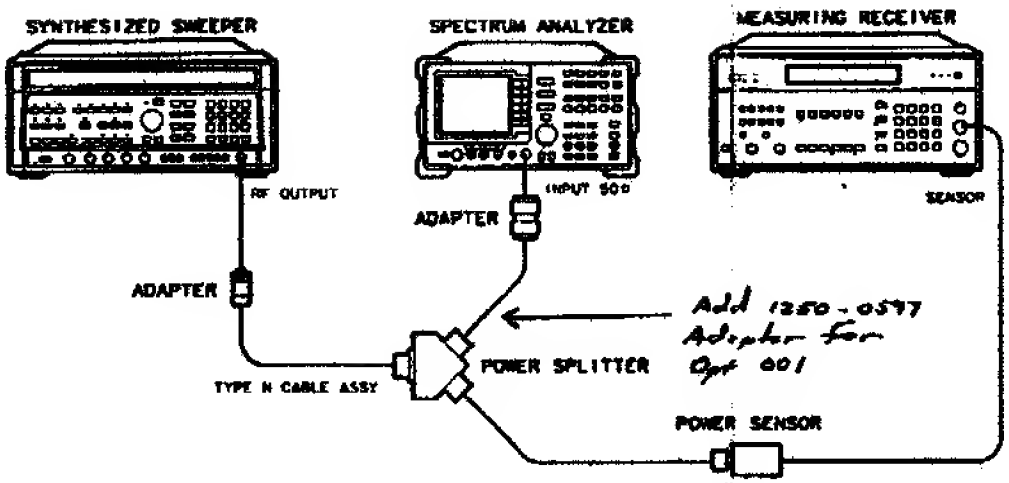


Figure 2-24. Frequency Response Setup

3. Press INSTRUMENT PRESET on the HP 8340A/B. Set the HP 8340A/B controls as follows:

   CW ..... 300 MHz
   FREQ STEP ..... ~~31 MHz~~ 50 MHz
   POWER LEVEL ..... −9 dBm (−4 for Opt 001)

4. On the analyzer, press the following keys:

   PRESET
   CAL ~~MORE 1 of 3~~
   ~~CORRECT ON OFF~~ (OFF)
   FREQUENCY 300 MHz
   ~~CF STEP AUTO MAN (MAN) 87 MHz~~ 50 MHz
   SPAN 5 MHz
   (*Option 001:* press ~~AMPLITUDE MORE 1 of 2 INPUT UNITS~~ dBm.) [DISPLAY] [DISPLAY UNITS]
   AMPLITUDE 10 −dBm (−2 for Opt 001)
   ~~SCALE LOG LIN (LOG) 1 dB~~ LOG dB/DIV (LOG) 1 dB
   ~~BW 1 MHz~~ [RES BW] 1 MHz
   PEAK SEARCH
   SIGNAL TRACK (ON)

5. Adjust the HP 8340A/B POWER LEVEL for a MKR-TRK amplitude reading of −14 dBm ±0.1 dB. (−10 dBm for Opt. 001)

6. Press RATIO mode on the HP 8902A.

7. Set the HP 8340A/B CW to ~~41 MHz~~. 10 MHz

8. Press the following analyzer keys:

   FREQUENCY ~~41 MHz~~ 10 MHz

10. Frequency Response

9. Adjust the HP 8340A POWER LEVEL for an analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB. (−10 dBm for Opt. 001)
10. Record the power ratio here and in Column 2 of Table 2-10 for ~~41 MHz~~. 10 MHz
    HP 8902A Reading at ~~41~~ 10 MHz _____ dB
11. Set the HP 8340A/B CW to ~~70 MHz~~. 50 MHz
12. Press the following analyzer keys:
    FREQUENCY ~~70~~ MHz 50 MHz
13. Adjust the HP 8340A/B POWER LEVEL for an analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB. (−10 dBm for Opt 001)
14. Record the power ratio displayed on the HP 8902A in Column 2 of Table 2-10 for 78 MHz.
15. On the HP 8340A/B, press CW and STEP UP.
16. On the analyzer, press FREQUENCY and ▲ (step up), to step through the remaining frequencies listed in Column 1 of Table 2-10. At each new frequency repeat steps 13 through 15, entering the power sensor Cal Factor into the HP 8902A as indicated in Column 3 of Table 2-10. Include 10 MHz Point

Frequency Response Error At 4 MHz

17. Using a cable, connect the HP 3335A directly to the INPUT 50Ω. See Figure 2-25.

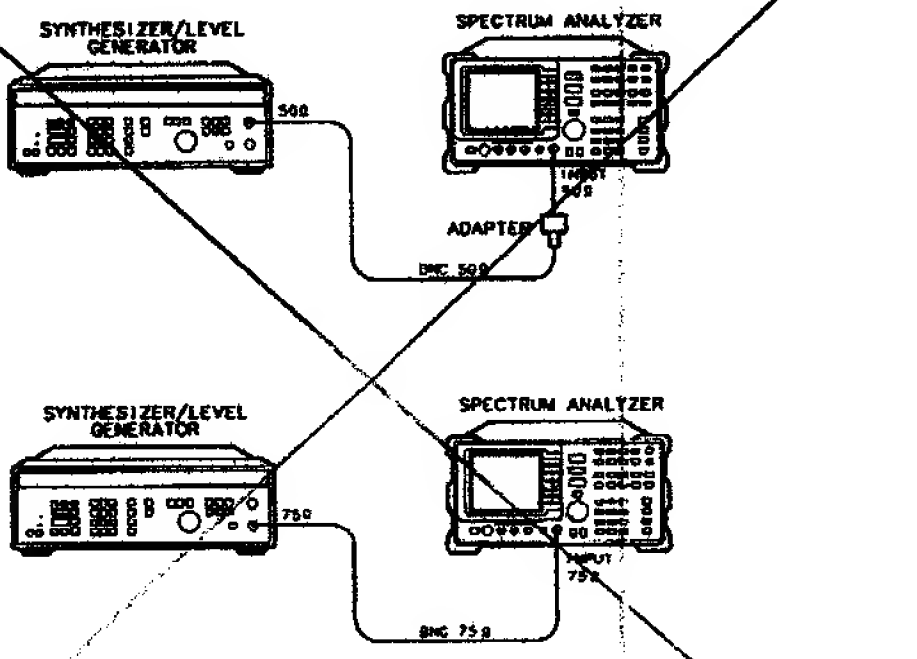


Figure 2-25. Frequency Response for 4 MHz Setup

(*Option 001:* Using a 75Ω cable, connect the HP 3335A from the 75Ω OUTPUT to the INPUT 75Ω. Set the HP 3335A 50–75Ω switch to the 75Ω position. See Figure 2-25.)

Set the HP 3335A controls as follows:

FREQUENCY ..... 41 MHz
AMPLITUDE ..... −15 dBm
AMPTD INCR ..... 0.05 dB

18. Press the following analyzer keys:

[SPAN] 10 [MHz]
[FREQUENCY] 41 [MHz]
[BW] 10 [kHz]
[SPAN] 100 [kHz]

Wait for AUTO ZOOM message to disappear.

19. Adjust the HP 3335A AMPLITUDE until the MKR-TRK reads −14 dBm. This corresponds to the amplitude at 41 MHz recorded in step 10. Record the HP 3335A amplitude here.

HP 3335A AMPLITUDE setting (41 MHz) _____ dBm

20. Set the HP 3335A FREQUENCY to 4 MHz.

21. AUTO ZOOM on the 4 MHz signal by pressing the following analyzer keys:

[FREQUENCY] 4 [MHz]
[MKR] MARKERS OFF
[SPAN] 20 [MHz]
[PEAK SEARCH] NEXT PK RIGHT
[SIGNAL TRACK] (ON)
[SPAN] 100 [kHz]

Wait for AUTO ZOOM message to disappear.

22. Adjust the HP 3335A AMPLITUDE for a MKR amplitude reading of −14.00 dBm ±.05 dB. Record the HP 3335A AMPLITUDE setting here.

HP 3335A AMPLITUDE setting (4 MHz) _____ dBm

23. Subtract the HP 3335A AMPLITUDE setting (4 MHz) recorded in Step 22 from the HP 3335A AMPLITUDE setting (41 MHz) recorded in Step 19. Record the result as the Amplitude Relative to 41 MHz here.

4 MHz Amplitude Relative to 41 MHz _____ dB

24. Add the result from Step 23 to the reading from Step 10 and enter that result in Column 2 of Table 2-10 (*Option 001:* Column 5) as the 4 MHz error (relative to 300 MHz).

Note

For Option 001 only: Starting with the error at 41 MHz, add Column 3 (System Error) to Column 2 (Error Relative to 300 MHz) and record the result in Column 5 (Corrected Error Relative to 300 MHz).

Entering Flatness Correction Data

25. Enter the pass code by pressing the following analyzer keys:

    PRESET
    FREQUENCY −2001 Hz

26. To access the flatness correction menu, press the following analyzer keys:

    (*Option 001 Only:* ~~AMPLITUDE MORE 1 of 2 AMPTD UNITS dBm~~) DISPLAY (DISPLAY UNITS) (DBM
    CAL ~~MORE 1 of 3 MORE 2 of 3~~ (CAL FLATNESS)
    ~~SERVICE CAL~~ (ENTER FLT ERR)
    ~~FLATNESS DATA~~ (START FREQ) 0 Mhz, (STOP FREQ) 1500 Mhz, (FREQ STEP) 50M

Note Perform the next step *only if* all the flatness correction data must be replaced in memory due to the repair or replacement of the A16 Processor/Video assembly.

~~27. To initialize the area of memory where the flatness correction data is stored, press the following keys:~~

~~INIT FLT~~
~~PRESET~~
~~FREQUENCY 2001 Hz~~
~~(*Option 001 Only:* AMPLITUDE MORE 1 of 2 AMPTD UNITS dBm)~~
~~CAL MORE 1 of 3 MORE 2 of 3~~
~~SERVICE CAL~~
~~FLATNESS DATA~~

~~28. To enter flatness corrections, press EDIT FLATNESS.~~

29. The frequency of the first data point, ~~4.00~~ 0 MHz, will be displayed in the active function block of the analyzer display. Enter the 10 Mhz Data

30. Use the DATA keys on the analyzer to enter the amplitude value for 4 MHz from Column 2 of Table 2-10 (*Option 001:* Column 5), Frequency Response Errors. Terminate the entry with the dB key. When entering negative amplitude values, precede the numeric entry with the − and dB keys or the −dB key.

Note The BK SP (backspace) key may be used to correct any entry if the terminator, dB or −dB key has *not* been pressed. Re-enter the data if the terminator has been pressed.

31. Press ▲ (step up) and enter the data from Table 2-10, Column 2 (*Option 001:* Column 5) for the next data point as described in step 29.

32. Repeat step 30 for the remaining flatness correction data points listed in Table 2-10.

Note

At each point, verify that the frequency listed in the active function block corresponds to the frequency at which the data was taken. If these two frequencies do not correspond, press ▲ (step up) or ▼ (step down) until the proper frequency is displayed in the active function block. If some data is incorrect after entering all of the data from Table 2-10, select the incorrect data point using ▲ (step up) or ▼ (step down) and re-enter the proper data.

33. After all corrections have been input, ~~press the STORE CORRECTION softkey to~~ store the correction data in nonvolatile memory. The instrument will automatically preset and display `CAL: DONE` in the active function block of the analyzer.

Table 2-10. Frequency Response Errors.

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR (GHz)	Column 4 (*Opt 001*) System Error (dB)	Column 5 (*Opt 001*) Corrected Error Relative to 300 MHz (dB)
10 ~~4~~		N/A	N/A	
~~50 41~~		0.03		
~~100 78~~		0.1		
~~150 115~~		0.1		
~~200 152~~		0.1		
~~250 189~~		0.3		
~~300 226~~		0.3		
~~350 263~~		0.3		
~~400 300~~		0.3		
~~450 337~~		0.3		
~~500 374~~		0.3		
~~550 411~~		0.3		
~~600 448~~		0.3		
~~650 485~~		0.3		
~~700 522~~		0.3		
~~750 559~~		1.0		
~~800 596~~		1.0		
~~850 633~~		1.0		
~~900 670~~		1.0		
~~950 707~~		1.0		
~~1000 744~~		1.0		
~~1050 781~~		1.0		
~~1100 818~~		1.0		
~~1150 855~~		1.0		
~~1200 892~~		1.0		

10. Frequency Response

Table 2-10. Frequency Response Errors. (continued)

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR (GHz)	Column 4 (*Opt 001*) System Error (dB)	Column 5 (*Opt 001*) Corrected Error Relative to 300 MHz (dB)
~~[illegible]~~		1.0		
~~[illegible]~~		1.0		
~~[illegible]~~		1.0		
~~[illegible]~~		1.0		
~~[illegible]~~		1.0		
~~[illegible]~~		1.0		
1151		1.0		
1188		1.0		
1225		1.0		
1262		1.0		
1299		1.0		
1336		1.0		
1373		1.0		
1410		1.0		
1447		1.0		
1484		1.0		
1521		1.0		
1558		2.0		
1595		2.0		
1632		2.0		
1669		2.0		
1706		2.0		
1743		2.0		
1780		2.0		
1817		2.0		

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699-2533

CHAPTER 3

REPLACEABLE PARTS

Introduction

This chapter provides information for ordering replacement parts for the HP 8590A Spectrum Analyzer. Table 3–1 includes a list of reference designations and a list of abbreviations used in the parts list. Table 3–2 lists names and addresses that correspond to the manufacturer code numbers in the parts list. Table 3–3 lists the replaceable parts in alphanumerical order by reference designation.

Replacement Parts Lists

Table 3–3, the list of replaceable parts is organized as follows:

1. Major assemblies and their part numbers
2. Accessories supplied and their part numbers
3. Illustrated parts breakdowns: Figures 3–1 through 3–5 show the major replaceable mechanical parts of the analyzer

The following information is listed for each part:

1. The Hewlett–Packard part number
2. The part number check digit (CD)
3. The total quantity (Qty) in the instrument; this quantity is given only once, at the first appearance of the part in the list
4. The description of the part
5. A five–digit code indicating a typical manufacturer of the part
6. The manufacturer's part number

Ordering Information

To order a part listed in the replaceable parts table, quote the Hewlett–Packard part number (with check digit), indicate the quantity required, and address the order to the nearest Hewlett–Packard office. The check digit will ensure accurate and timely processing of your order.

To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett–Packard office.

Table 3–1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (1 OF 2)

REFERENCE DESIGNATIONS

A ..... Assembly
AT ..... Attenuator, Isolator, Limiter, Termination
B ..... Fan, Motor
BT ..... Battery
C ..... Capacitor
CP ..... Coupler
CR ..... Diode, Diode Thyristor, Step Recovery Diode, Varactor
DC ..... Directional Coupler
DL ..... Delay Line
DS ..... Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Visible)
E ..... Miscellaneous Electrical Part
F ..... Fuse
FL ..... Filter
HY ..... Circulator
J ..... Electrical Connector (Stationary Portion), Jack
K ..... Relay
L ..... Coil, Inductor
M ..... Meter
MP . Miscellaneous Mechanical Part
P ..... Electrical Connector (Movable Portion), Plug
Q ..... Silicon Controlled Rectifier (SCR), Transistor, Triode Thyristor
R ..... Resistor
RT ..... Thermistor
S ..... Switch
T ..... Transformer
TB ..... Terminal Board
TC ..... Thermocouple
TP ..... Test Point
U .... Integrated Circuit, Microcircuit
V ..... Electron Tube
VR ..... Breakdown Diode (Zener), Voltage Regulator
W ..... Cable, Wire, Jumper
X ..... Socket
Y ..... Crystal Unit (Piezoelectric, Quartz)
Z ..... Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A ..... Across Flats, Acrylic, Air (Dry Method), Ampere
ADJ ..... Adjust, Adjustment
ANSI ..... American National Standards Institute
ASSY ..... Assembly
AWG ..... American Wire Gage

B

BCD ..... Binary Coded Decimal
BD ..... Board, Bundle
BE-CU ..... Beryllium Copper
BNC ..... Type of Connector
BRG ..... Bearing, Boring
BRS ..... Brass
BSC ..... Basic
BTN ..... Button

C

C ..... Capacitance, Capacitor, Center Tapped, Cermet, Cold Compression
CCP .... Carbon Composition Plastic
CD ..... Cadmium, Card, Cord
CER ..... Ceramic
CHAM ..... Chamfer
CHAR ..... Character, Characteristic, Charcoal
CMOS ..... Complementary Metal Oxide Semiconductor
CNDCT .... Conducting, Conductive Conductivity, Conductor
CONT ..... Contact, Continuous, Control, Controller
CONV ..... Converter
CPRSN ..... Compression
CUP-PT ..... Cup Point
CW ... Clockwise, Continuous Wave

D

D ..... Deep, Depletion, Depth, Diameter, Direct Current
DA ..... Darlington
DAP-GL ..... Diallyl Phthalate Glass
DBL ..... Double
DCDR ..... Decoder
DEG ..... Degree
D-HOLE ..... D-Shaped Hole
DIA ..... Diameter
DIP ..... Dual In-Line Package
DIP-SLDR ..... Dip Solder
D-MODE ..... Depletion Mode
DO ..... Package Type Designation
DP ..... Deep, Depth, Diametric Pitch, Dip
DP3T .... Double Pole Three Throw
DPDT ... Double Pole Double Throw
DWL ..... Dowel

E

E-R ..... E-Ring
EXT ..... Extended, Extension, External, Extinguish

F

F ..... Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Frequency
FC ..... Carbon Film/Composition, Edge of Cutoff Frequency, Face
FDTHRU ..... Feed Through
FEM ..... Female
FIL-HD ..... Fillister Head
FL ..... Flash, Flat, Fluid
FLAT-PT ..... Flat Point
FR ..... Front
FREQ ..... Frequency
FT ..... Current Gain Bandwidth Product (Transition Frequency), Feet, Foot
FXD ..... Fixed

G

GEN ..... General, Generator
GND ..... Ground
GP ..... General Purpose, Group

H

H ..... Henry, High
HDW ..... Hardware
HEX ..... Hexadecimal, Hexagon, Hexagonal
HLCL ..... Helical
HP ..... Hewlett-Packard Company, High Pass

I

IC ..... Collector Current, Integrated Circuit
ID ... Identification, Inside Diameter
IF ..... Forward Current, Intermediate Frequency
IN ..... Inch
INCL ..... Including
INT ..... Integral, Intensity, Internal

J

J-FET ..... Junction Field Effect Transistor
JFET ..... Junction Field Effect Transistor

K

K ..... Kelvin, Key, Kilo, Potassium
KNRLD ..... Knurled
KVDC ..... Kilovolts Direct Current

Table 3–1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (2 OF 2)

L

LED ..... Light Emitting Diode
LG ..... Length, Long
LIN ..... Linear, Linearity
LK ..... Link, Lock
LKG ..... Leakage, Locking
LUM ..... Luminous

M

M ..... Male, Maximum, Mega, Mil, Milli, Mode
MA ..... Milliampere
MACH ..... Machined
MAX ..... Maximum
MC ... Molded Carbon Composition
MET ..... Metal, Metallized
MHZ ..... Megahertz
MINTR ..... Miniature
MIT ..... Miter
MLD ..... Mold, Molded
MM ..... Magnetized Material, Millimeter
MOM ..... Momentary
MTG ..... Mounting
MTLC ..... Metallic
MW ..... Milliwatt

N

N ..... Nano, None
N-CHAN ..... N-Channel
NH ..... Nanohenry
NM ..... Nanometer, Nonmetallic
NO ..... Normally Open, Number
NOM ..... Nominal
NPN ..... Negative Positive Negative (Transistor)
NS ..... Nanosecond, Non-Shorting Nose
NUM ..... Numeric
NYL ..... Nylon (Polyamide)

O

OA ..... Over-All
OD ..... Outside Diameter
OP AMP ..... Operational Amplifier
OPT ..... Optical, Option, Optional

P

PA .... Picoampere, Power Amplifier
PAN-HD ..... Pan Head
PAR ..... Parallel, Parity
PB ..... Lead (Metal), Pushbutton
PC ..... Printed Circuit
PCB ..... Printed Circuit Board
P-CHAN ..... P-Channel
PD ..... Pad, Power Dissipation
PF ..... Picofarad, Power Factor
PKG ..... Package
PLSTC ..... Plastic
PNL ..... Panel
PNP ..... Positive Negative Positive (Transistor)
POLYC ..... Polycarbonate
POLYE ..... Polyester
POT ..... Potentiometer
POZI ..... Pozidriv Recess
PREC ..... Precision
PRP ..... Purple, Purpose
PSTN ..... Piston
PT ..... Part, Point, Pulse Time
PW ..... Pulse Width

Q

Q ..... Figure of Merit

R

R ..... Range, Red, Resistance, Resistor, Right, Ring
REF ..... Reference
RES ..... Resistance, Resistor
RF ..... Radio Frequency
RGD ..... Rigid
RND ..... Round
RR ..... Rear
RVT ..... Rivet, Riveted

S

SAWR ..... Surface Acoustic Wave Resonator
SEG ..... Segment
SGL ..... Single
SI ..... Silicon, Square Inch
SL ..... Slide, Slow
SLT ..... Slot, Slotted
SMA ..... Subminiature, A Type (Threaded Connector)
SBM ..... Subminiature, B Type (Slip-On Connector)
SMC ..... Subminiature, C Type (Threaded Connector)
SPCG ..... Spacing
SPDT .... Single Pole Double Throw
SPST ..... Single Pole Single Throw
SQ ..... Square
SST ..... Stainless Steel
STL ..... Steel
SUBMIN ..... Subminiature
SZ ..... Size

T

T ..... Teeth, Temperature, Thickness, Time, Timed, Tooth, Typical
TA ..... Ambient Temperature, Tantalum
TC ..... Temperature Coefficient
THD ..... Thread, Threaded
THK ..... Thick
TO ..... Package Type Designation
TPG ..... Tapping
TR-HD ..... Truss Head
TRMR ..... Trimmer
TRN ..... Turn, Turns
TRSN ..... Torsion

U

UCD ..... Microcandela
UF ..... Microfarad
UH ..... Microhenry
UL ..... Microliter, Underwriters' Laboratories, Inc.
UNHDND ..... Unhardened

V

V ... Variable, Violet, Volt, Voltage
VAC ... Vacuum, Volts, Alternating Current
VAR ..... Variable
VDC ..... Volts, Direct Current

W

W ..... Watt, Wattage, White, Wide, Width
W/SW ..... With Switch
WW ..... Wire Wound

X

X ..... By (Used With Dimensions), Reactance

Y

YIG ..... Yttrium-Iron-Garnet

Z

ZNR ..... Zener

Table 3–2. Manufacturers Code List

Mfr Code	Manufacturer Name	Address		Zip Code
S4013	HITACHI AMERICA LTD	SUNNYVALE	CA	94086
S4111	TOKYO HATSODUKI CO LTD	TOKYO	JP	
S4307	SCHAFFNER AG	LUTERBACH	SW	
00000	ANY SATISFACTORY SUPPLIER			
00779	AMP INC	HARRISBURG	PA	17111
01121	ALLEN-BRADLEY CO INC	EL PASO	TX	79935
01295	TEXAS INSTRUMENTS INC	DALLAS	TX	75265
03888	K D I PYROFILM CORP	WHIPPANY	NJ	07981
04713	MOTOROLA INC SEMI-COND PROD	PHOENIX	AZ	85008
06665	PRECISION MONOLITHICS INC	SANTA CLARA	CA	95050
07263	FAIRCHILD CORP	MOUNTAIN VIEW	CA	94042
10899	EASTERN AIR DEVICES INC	GREAT NECK	NY	11021
11045	AM CASTLE & CO INC	FRANKLIN PARK	IL	60131
11236	CTS CORP BERNE DIV	BERNIE	IN	46711
13606	SPRAGUE ELECTRIC SEMICON DIV	CONCORD	NH	03301
16299	CORNING ELECTRONICS	RALEIGH	NC	27604
17856	SILICONIX INC	SANTA CLARA	CA	95054
18736	VOLTRONICS CORP	HANOVER	NJ	07936
19701	MEPCO/CENTRALAB INC	WEST PALM BEACH	FL	33407
2M627	ROHM CORP	IRVINE	CA	92718
24355	ANALOG DEVICES INC	NORWOOD	MA	02062
24546	CORNING ELECTRONICS	SANTA CLARA	CA	95050
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95052
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	04304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	94806
34344	MOTOROLA INC	FRANKLIN PARK	IL	60131
34371	HARRIS CORP	MELBOURNE	FL	32901
34649	INTEL CORP	SANTA CLARA	CA	95054
37942	MALLORY P R AND CO INC	INDIANAPOLIS	IN	46206
4N633	ETRI INC	MONROE	NC	28110
51633	FLUOROCARBON CO THE	SUNNYVALE	CA	94088
52763	STETTNER ELECTRONICS INC	CHATTANOOGA	TN	37421
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247
72136	ELECTRO MOTIVE CORP	FLORENCE	SC	06226
72962	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE	PA	16512
73138	BECKMAN INDUSTRIAL CORP	FULLERTON	CA	92632
73899	J F D ELECTRONICS CORP	BROOKLYN	NY	11219
74970	EF JOHNSON CO	WASECA	MN	56093
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN	IL	60126
84411	TRW CAPACITOR DIV	OGALLALA	NE	69153
9N171	UNITRODE CORP	LEXINGTON	MA	02173
91637	DALE ELECTRONICS INC	EL PASO	TX	79936

REF. DESIG.	HP PART NUMBER	DESCRIPTION
A1	08950-60004	KEYBOARD BOARD ASSEMBLY
A1J1	1252-1065	CONNECTOR, 24 CONN.
A1J2	1251-7678	CONNECTOR, 5 CONT.
A1J3	1251-7678	CONNECTOR, 5 CONT.
A1MP1	08590-20004	BOARD - KEYBOARD
A2	5062-6404	OEM, CRT DISPLAY (PRETESTED)
A2MP1	08590-00006	SHIELD, CRT
A3	0955-0453	ATTENUATOR, PROGRAMMABLE; 0 - 60 dB
A4	08590-60047	1st CONVERTER ASSEMBLY → A4 J1 [illegible]
A4J1	1250-1796	CONNECTOR, RF; SMA 50 OHM
A4J2	1250-1796	CONNECTOR, RF; SMA 50 OHM
A4J3	1250-1796	CONNECTOR, RF; SMA 50 OHM
A4J4	1250-1796	CONNECTOR, RF; SMA 50 OHM
A5	08590-60048	2nd CONVERTER ASSEMBLY
A5A1	08558-60028	" " OSCILLATOR
A6	0955-0454	YIG OSCILLATOR
A6A1	08590-60029	YIG BOARD ASSEMBLY
A7	08590-60001	ANALOG BOARD INTERFACE ASSEMBLY
A8	0950-1819	POWER - SUPPLY; POWER 75 WATT; 4 OUTPUTS
A9	08590-60073	3rd CONVERTER BOARD ASSEMBLY (STD)
A9	08590-60078	3rd CONVERTER BOARD ASSEMBLY (001)
A10	08590-60055	2nd IF BOARD ASSEMBLY
A11	08590-60050	BANDWIDTH FILTER BOARD ASSEMBLY
A12	08590-60039	STEP GAIN BOARD ASSEMBLY
A13	08590-60050	BANDWIDTH FILTER BOARD ASSEMBLY
A14	08590-60075	LOG AMP BOARD ASSEMBLY
A15	08590-60003	IF MOTHERBOARD ASSEMBLY
A16	08590-60002	PROCESSOR A/D BOARD ASSEMBLY
A17	08590-60070	VIDEO BOARD ASSEMBLY
A18	08590-60068	HP-IB I/O BOARD ASSEMBLY
A19	08590-60018	HP-IB CONNECTOR ASSEMBLY
	08590-60052	HP-IB KIT [illegible]

1st converter diodes.

Fail 2110-0773

A20	9135-0270	FILTER, LINE; 250 VOLT MAX.
A21	08590-60012	RS-232 I/O ASSEMBLY
A22	08590-60019	RS-232 CONNECTOR ASSEMBLY
A23	08590-60013	HP-IL I/O ASSEMBLY
A24	08590-60020	HP-IL CABLE CONNECTOR ASSEMBLY
B1	5062-0736	FAN ASSEMBLY
J1	SEE W4	
W1	08590-60024	CABLE ASSEMBLY; 1st LO OUTPUT
W2	08590-60026	CABLE ASSEMBLY; CAL OUT (STD)
W2	08590-60028	CABLE ASSEMBLY; CAL OUT (001)
W3	08590-60065	CABLE ASSEMBLY; PROBE POWER
W4	08590-60023	CABLE ASSEMBLY; RF INPUT
OPT 001	08590-60090	MLA W/W4
W5	5061-9026	WIRING ASSEMBLY; RPG
W6	08590-60014	CABLE ASSEMBLY; RIBBON 24C
W7	08590-60021	CABLE ASSEMBLY; VIDEO
W8	08590-20057	CABLE ASSEMBLY; ISOLATOR - 1st CONVERTER
W9	08590-20059	CABLE ASSEMBLY; LPF - 2nd CONVERTER
W10	08590-20007	CABLE ASSEMBLY; RF ATTEN - 1st CONVERTER
W11	08590-60022	CABLE ASSEMBLY; DC POWER
W12	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W13	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W14	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W15	08590-60025	CABLE ASSEMBLY; 2nd CONVERTER - IF
W16	08590-60027	CABLE ASSEMBLY; 2nd IF - 3rd MIXER
W17	SEE A18, A21 & A23; P/O REMOTE I/O ASSEMBLIES	
W18	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W19	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W20	8120-4823	CABLE ASSEMBLY; 2 PHONO; 9.5
W21	08590-20056	CABLE ASSEMBLY; YIG - ISOLATOR
W22	08590-20058	CABLE ASSEMBLY; 1st CONVERTER - LPF
W23	08590-60041	CABLE ASSEMBLY; INTENSITY POT
W24	5062-0784 5062-1998	CABLE ASSEMBLY; LINE SWITCH
W25	08590-60017	CABLE ASSEMBLY; LINE SELECT
W26	08590-60037	CABLE ASSEMBLY; CRT INTENSITY
W1	08590-60024	CABLE ASSEMBLY; 1st LO OUTPUT
W1	08590-60024	CABLE ASSEMBLY; 1st LO OUTPUT
W1	08590-60024	CABLE ASSEMBLY; 1st LO OUTPUT

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	08590-60004	5	1	KEYBOARD BOARD ASSEMBLY	28480	08590-60004
A1J1	1252-1065	5	1	CONN-POST TYPE .100-PIN-SPCG 24-CONT	28480	1252-1065
A1J2	1251-7678	6	2	CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1251-7678
A1J3	1251-7678	6		CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1251-7678
A1MP1	08590-20004	1	1	BD-KEYBOARD	28480	08590-20004
	08590-68004	1	1	PC KIT CNTR SET	28480	08590-68004
A2 5042-6404	~~0950-1813~~	0	1	OEM CRT DATA DISPLAY; 75 X 102 MM	28480	0950-1813
A3	~~0955-0327~~ 0453	1	1	ATTENUATOR, PROGRAMMABLE 0-80	28480	0955-0329

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4	08590-60047	6	1	1ST CONVERTER ASSEMBLY	28480	08590-60047
A4J1	1250-1708	5	4	CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1708
A4J2	1250-1708	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1708
A4J3	1250-1708	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1708
A4J4	1250-1708	5		CONNECTOR-RF SMA FEM SGL-HOLE-RR 50-OHM	28480	1250-1708
A4MP1	08558-00052	7	1	GASKET 1ST CONV	28480	08558-00052
A4MP2	08590-20023	4	1	COVER-1ST CONV	28480	08590-20023
A4MP3	08590-20022	3	1	MOUNT-1ST CONV	28480	08590-20022
A4R1	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A4R2	0698-2033	4	1	RESISTOR 237 1% .05W F TC=0+-100	91637	CMF-50-21
A4R3	0698-2032	3	2	RESISTOR 147 1% .05W F TC=0+-100	91637	CMF-50-21
A4R4	0698-1947	7	1	RESISTOR 38.3 1% .05W F TC=0+-100	91637	CMF-50-21
A4R5	0698-2032	3		RESISTOR 147 1% .05W F TC=0+-100	91637	CMF-50-21
A4U1	5082-0765	5	1	DIODE ASSY	28480	5082-0765
	5021-6800	1	1	DIODE MOUNT	28480	5021-6800
				MISCELLANEOUS PARTS		
	2190-0067	4	4	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0067
	2200-0168	9	18	SCREW-MACH 4-40 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5A1						
	60174			KEPL KIT, 2ND		
A5	08590-60048	7	1	2ND CONVERTER ASSEMBLY	28480	08590-60048
A5C1	0160-3038	9	2	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3038
A5C2	0160-3038	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3038
A5C3	0160-5435	5	1	CAPACITOR-FDTHRU 8.5PF 8% 200V CER	28480	0160-5435
A5C4	0140-0076	7	1	CAPACITOR-FDTHRU 22PF 10% 500V MICA	72982	566-053-01A0-220K
A5CR1	1901-0950	2	1	DIODE-SM SIG SCHOTTKY	28480	1901-0950
A5J1	1250-1157	2	1	CONNECTOR-RF SMA FEM THD-HOLE 50-OHM	28480	1250-1157
A5J2	1250-1436	9	1	CONN:RF: 500 OHM: SMC	28480	1250-1436
A5J3	1250-0691	7	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A5J4	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A5L3	08565-80003	5	1	COIL 2ND CONV	28480	08565-80003
A5L4	9100-2255	4	1	INDUCTOR RF-CH-MLD 470NH 10%	28480	9100-2255
A5MP1	08565-20067	5	1	BLOCK CAVITY	28480	08565-20067
A5MP3	08565-20092	6	1	CAP DIELECTRIC	28480	08565-20092
A5MP3	2200-0151	0	1	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A5MP4	08565-20068	8	1	CAP INNER ELEMENT	28480	08565-20068
A5MP5	08565-00152	7	1	MTG TAB MXR DIO	28480	08565-00152
A5MP5	2200-0171	4	1	SCREW-MACH 4-40 .75-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
A5MP7	3030-0397	6	4	SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP8	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP9	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP10	3030-0397	6		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	00000	ORDER BY DESCRIPTION
A5MP11	0380-0573	9	1	STANDOFF-HEX .625-IN-LG 10-32-THD	28480	0380-0573
A5MP11	2740-0001	3	3	NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP12	2740-0001	3		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP13	2740-0001	3		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A5MP14	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A5MP22	08558-20074	5	1	INSUL CPLG POST	28480	08558-20074
A5R3	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
	0360-0002	8	1	TERMINAL-SLDR LUG PL-MTG FOR-#2-SCR	28480	0360-0002
	0360-0043	5	1	TERMINAL-SLDR LUG PL-MTG FOR-#6-SCR	28480	0360-0043
	0520-0173	2	1	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0520-0174	3	2	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	08558-00034	5	1	CPLG LOOP INPUT	28480	08558-00034
A5A1	08558-60028	3	1	BD 2ND CONV OSC	28480	08558-60028
	08565-00153	8	2	CPLG LOOP FILTER	28480	08565-00153
	08590-00014	1	1	CVR-OSC HOUSING	28480	08590-00014
	08590-20020	1	1	COVER-2ND CONV	28480	08590-20020
	08590-60033	0	1	CBL ASSY ANL PWR	28480	08590-60033
	08590-60037	4	1	CBL AY-CRT INTEN	28480	08590-60037
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2190-0557	7	3	WASHER-LK INTL T NO. 10 .195-IN-ID	78189	1218-06-00-0551
	2190-0572	6	6	WASHER-LK MLCL NO. 0 .062-IN-ID .1-IN-OD	28480	2190-0572
	2200-0105	4	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0107	6	18	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0119	0	8	SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	3030-0400	2	6	SCREW-SKT HD CAP 0-80 .094-IN-LG SST	00000	ORDER BY DESCRIPTION
	3050-0003	3	1	WASHER-FL NM NO. 8 .141-IN-ID .375-IN-OD	28480	3050-0003
	3050-0176	1	4	WASHER-FL MTLC NO. 8 .188-IN-ID	11045	AA-0107-2SS
	3050-0945	2	1	WASHER-FL MTLC NO. 10 .2-IN-ID .33-IN-OD	28480	3050-0945
	6040-0454	0	1	THERMAL COMPOUND	28480	6040-0454
	8090-0607	2	1	SOLDER WIRE 361-DEF F .036-W-DIA	28480	8090-0607
A5A1R1	0683-4705	8	1	RESISTOR 47 5% .25W CF TC=0-400	01121	CB4705
A5A1R2	0683-2715	6	1	RESISTOR 270 5% .25W CF TC=0-400	01121	CB2715

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6	0955-0454	4	1	YIG OSCILLATOR	28480	0955-0330
A6MP1	08590-00009	4	1	SHIELD-YIG	28480	08590-00009
A6MP2	08590-00010	7	1	COVER-SHLD-YIG	28480	08590-00010
A6A1	08590-60029	4	1	YIG BOARD ASSEMBLY	28480	08590-60029
A6A1J1	1251-7683	3	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	00779	87227-5
A6A1MP2	1251-3172	7	1	CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A6A1MP3	1251-2313	6	1	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A6A1VR1	1902-3224	1	1	DIODE-ZNR 17.8V 5% DO-35 PD=0.4W	28480	1902-3224
A6A1VR2	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=0.4W	28480	1902-0049

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7	08590-60001	2	1	ANALOG INTERFACE BOARD ASSEMBLY	28480	08590-60001
A7C1	0180-0116	1	9	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C2	0160-4832	4	4	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A7C3	0160-4835	7	43	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A7C12	0160-4800	6	2	CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A7C13	0160-6502	9	1	CAPACITOR-FXD 10UF +-2% 50VDC MET-POLYC	84411	HEM-249
A7C14	0160-5916	7	1	CAPACITOR-FXD .2UF +-1% 200VDC MET-POLYP	28480	0160-5916
A7C15	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C16	0160-4836	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C17	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C19	0160-4800	6		CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A7C20	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A7C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C22	0160-4831	3	1	CAPACITOR-FXD 4700PF +-10% 100VDC CER	28480	0160-4831
A7C23	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C24	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C25	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C27	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C28	0160-3787	6	1	CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A7C29	0160-4947	2	1	CAPACITOR-FXD 2UF +-20% 50VDC MET-POLYE	28480	0160-4947
A7C30	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C32	0160-3510	3	3	CAPACITOR-FXD 3UF +-10% 50VDC MET-POLYC	28480	0160-3510
A7C33	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C34	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C35	0160-3510	3		CAPACITOR-FXD 3UF +-10% 50VDC MET-POLYC	28480	0160-3510
A7C36	0160-3658	0	1	CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-3658
A7C37	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C38	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C39	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C40	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C41	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C42	0160-5098	6	2	CAPACITOR-FXD .22UF +-10% 50VDC CER	16299	CAC05X7R224J050A
A7C43	0160-3510	3		CAPACITOR-FXD 3UF +-10% 50VDC MET-POLYC	28480	0160-3510
A7C44	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A7C45	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C46	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C47	0180-0378	5	1	CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
A7C48	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C49	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C50	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C51	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C52	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C53	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C54	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C55	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7C56	0160-4834	6	1	CAPACITOR-FXD .047UF +-10% 100VDC CER	28480	0160-4834
A7C57	0160-5098	6		CAPACITOR-FXD .22UF +-10% 50VDC CER	16299	CAC05X7R224J050A
A7C58	0160-5438	8	1	CAPACITOR-FXD 1.0UF +-10% 90VDC POLYE	28480	0160-5438
A7C59	0180-2500	1	1	CAPACITOR-FXD 1500UF+50-10% 16VDC AL	37942	TT1S2U018G1C3P
A7C60	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7C101	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C102	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C103	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C104	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C105	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C106	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C107	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C108	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C109	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C110	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C111	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C112	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7C113	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A7CR1	1901-0050	3	4	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A7CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A7CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A7CR6	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7CR7	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7CR101	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A7J1	1251-7986	9	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-7986
A7J2	1251-7983	3	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	00779	87227-5
A7J3	1252-0025	5	1	CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1252-0025
A7J4	1252-0718	3	1	CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1252-0718
A7J5	1251-2969	8	1	CONNECTOR-PHONO SINGLE PHONO JACK; DIP	28480	1251-2969
A7J6	1251-5380	3	1	CONNECTOR 2-PIN M POST TYPE	28480	1251-5380
A7J7	1251-4926	1	1	CONNECTOR 8-PIN M POST TYPE	28480	1251-4926
A7MP6	08590-20018	7	1	STANDOFF-RF	28480	08590-20018
A7MP7	08590-20027	8	1	NUT-STANDOFF	28480	08590-20027
A7Q1	1854-0460	4	1	TRANSISTOR NPN SI TO-3 PD=150W FT=600KHZ	28480	1854-0460 04/56
A7Q2	1853-0314	9	1	TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A7Q3	1855-0417	7	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0417
A7Q4	1855-0586	2	1	TRANSISTOR MOSFET P-CHAN E-MODE TO-92 SI	17856	VP0300L
A7Q5	1856-0420	2	1	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A7Q6	1854-0215	1	1	TRANSISTOR NPN SI TO-92 PD=350MW	04713	2N3904
A7Q7	1855-0414	4	1	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	17856	2N4393
A7Q101	1853-0036	2	1	TRANSISTOR PNP SI PD=310MW FT=250MHZ	27014	2N3906
A7R1	0698-6624	5	2	RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A7R2	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A7R3	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2610-F
A7R4	0698-0465	2	1	RESISTOR 46.33K .1% .1W F TC=0+-10	28480	0698-0465
A7R5	0698-6343	5	2	RESISTOR 9K .1% .125W F TC=0+-25	28480	0698-6343
A7R6	0698-6344	6	1	RESISTOR 900 .1% .125W F TC=0+-25	28480	0698-6344
A7R7	0698-6323	1	1	RESISTOR 100 .1% .125W F TC=0+-25	28480	0698-6323
A7R8	0698-6353	7	2	RESISTOR 50K .1% .125W F TC=0+-25	28480	0698-6353
A7R9	0698-6353	7		RESISTOR 50K .1% .125W F TC=0+-25	28480	0698-6353
A7R10	0698-1909	1	1	RESISTOR 2.31K .1% .125W F TC=0+-25	2M627	CRB14
A7R11	0698-6322	0	2	RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A7R12	0698-6322	0		RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A7R13	0698-6907	1	1	RESISTOR 320 .25% .25W F TC=0+-50	28480	0698-6907
A7R14	0757-0417	9	1	RESISTOR 562 1% .125W F TC=0+-100	24546	CT4-1/8-T0-562R-F
A7R15	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A7R16	0757-0280	3	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A7R17	0698-6343	5		RESISTOR 9K .1% .125W F TC=0+-25	28480	0698-6343
A7R18	0698-6362	9	1	RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
A7R19	0699-0903	3	7	RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R20	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R21	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R22	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R23	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R24	0698-0233	2	1	RESISTOR 3.4K 0.1% 0.1W F TC=0+-10	19701	
A7R25	0699-1865	8	2	RESISTOR 3K 0.1% 0.1W F TC=0+-10	19701	50232
A7R26	0699-2265	4	4	RESISTOR 200 0.1% 1W F TC=0+-10	19701	

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7R29	0699-0098	7	1	RESISTOR 6K .1% .1W F TC=0+-15	28480	0699-0098
A7R30	0699-1866	9	1	RESISTOR 2.7K .1% .1W F TC=0+-10	19701	5023Z
A7R31	0699-1910	4	1	RESISTOR 681.2K .1% .125W F TC=0+-25	2M627	CRB14
A7R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A7R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A7R34	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R35	0698-6360	6	2	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A7R36	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
A7R37	0699-1865	8		RESISTOR 3K .1% .1W F TC=0+-10	19701	5023Z
A7R38	0757-0278	7	1	RESISTOR 61.9 1% 0.125W F TC=0 +-100	24540	CT4-1/8-TO-6192-F
A7R39	0699-2265	4		RESISTOR 200 0.1% 1W F TC=0+-10	19701	
A7R40	0699-2265	4		RESISTOR 200 0.1% 1W F TC=0+-10	19701	
A7R41	0699-2265	4		RESISTOR 200 0.1% 1W F TC=0+-10	19701	
A7R42	0698-3132	4		RESISTOR 261 1% 0.125W F TC=0+-100	24546	CT4-1/8-TO-2610-F
A7R43	0699-0903	3		RESISTOR 10K .1% .1W F TC=0+-10	28480	0699-0903
A7R44	0757-0442	9	19	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R45	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A7R48	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A7R49	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A7R50	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A7R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R52	0698-3400	9	1	RESISTOR 147 1% .5W F TC=0+-100	28480	0698-3400
A7R101	0698-6830	3	6	RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6830
A7R102	0698-6830	3		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6830
A7R103	0698-6830	3		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6830
A7R104	0698-6830	3		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6830
A7R105	0698-6819	8		RESISTOR 15K 0.1% 0.125W F TC=0+-25	28480	0698-6819
A7R106	0698-6819	8		RESISTOR 15K 0.1% 0.125W F TC=0+-25	28480	0698-6819
A7R107	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R108	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R110	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R111	0757-0458	7	11	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R112	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R113	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R114	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R115	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R116	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R117	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R118	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R119	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R120	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R121	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R122	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R123	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R124	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R125	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R126	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R127	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R128	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R129	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R130	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R131	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R132	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A7R133	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A7R134	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A7U1	1820-3100	8	1	IC DCDR TTL ALS BIN 3-TO-8-LINE 3-INP	01295	SN74ALS138N
A7U2	1820-1997	7	14	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U3	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U4	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U5	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A7U6	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U7	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U8	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U9	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U10	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U11	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	343*5	AM74LS374AP
A7U12	1826-1386	0	5	D/A 12-BIT 18-PLASTIC CMOS	24355	AD11/548
A7U13	1826-1386	0		D/A 12-BIT 18-PLASTIC CMOS	24355	AD11/548
A7U14	1826-1386	0		D/A 12-BIT 18-PLASTIC CMOS	24355	AD11/548
A7U15	1826-1386	0		D/A 12-BIT 18-PLASTIC CMOS	24355	AD11/548
A7U16	1826-1386	0		D/A 12-BIT 18-PLASTIC CMOS	24355	AD11/548
A7U17	1826-1048	1	13	IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U18	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U19	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U20	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U21	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U22	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U23	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U24	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U25	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U26	1826-1049	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U27	1826-1049	2	1	IC OP AMP PRCN 8-DIP-C PKG	06665	OP-27GZ
A7U28	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U29	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U30	1826-1459	8	1	IC OP AMP CUR 14-DIP-C PKG	06665	OP50-001Y
A7U31	1826-0610	1	2	IC MULTIPLXR 4-CHAN-ANLG DUAL 16-DIP-C	06665	MUX24FQ
A7U32	1826-0610	1		IC MULTIPLXR 4-CHAN-ANLG DUAL 16-DIP-C	06665	MUX24FQ
A7U33	1826-0609	8	1	IC MULTIPLXR ANLG 16-DIP-C PKG	06665	MUX08FQ
A7U34	1826-1514	6	1	IC V RGLTR-V-REF-FXD 9.995/10.005V	10899	LT1021BCN8-10
A7U35	1826-1186	8	2	ANALOG SWITCH 4 SPST 16 -CERDIP	06665	SW-06GQ
A7U36	1826-0611	4	1	IC SWITCH ANLG QUAD 16-DIP-C PKG	06665	SW-01FQ
A7U37	1826-1186	8		ANALOG SWITCH 4 SPST 16 -CERDIP	06665	SW-06GQ
A7U38	1826-0498	1	1	IC V RGLTR TO-39	04713	MC78L06ACG 1826-0220
A7U39	1826-1048	1		IC OP AMP PRCN 8-DIP-C PKG	06665	OP-07CZ
A7U40	1826-0915	9	1	IC OP AMP LOW-BIAS-H-IMPD 8-DIP-C PKG	04713	MC34001BD 1826-1461
A7U101	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U102	1826-1253	0	3	D/A 18-CERDIP BPLR	06665	DAC86EX
A7U103	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U104	1826-1253	0		D/A 18-CERDIP BPLR	06665	DAC86EX
A7U105	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U106	1826-1253	0		D/A 18-CERDIP BPLR	06665	DAC86EX
A7U107	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A7U108	1820-0471	0	1	IC INV TTL HEX 1-INP	01295	SN7406N
A7U109	1858-0074	8	3	TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ6100
A7U110	1858-0047	5	1	TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A7U111	1858-0074	8		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ6100
A7U112	1858-0074	8		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ6100
A7VR1	1902-0029	8	1	DIODE-ZNR 12V 5% PD=1W IR=5UA	28480	1902-0029
A7VR2	1902-3149	9	1	DIODE-ZNR 9.09V 5% DO-35 PD=.4W	28480	1902-3149
A7VR101	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A7U1	8159-0005	0	2	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A7U2	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A8	0950-1819	6	1	PWR-SUPPLY; POWER-75W; NO -OF-OUTPUTS-4	28480	0950-1819

See introduction to this section for ordering information
*Indicates factory selected value

OPT 001 PARTS LIST

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9	08590-60073		1	3RD CONVERTER BOARD ASSEMBLY	28480	08590-60073
A9	08590-60073			3LD OPT 001		
A9C1	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A9C2	0160-4795	8	1	CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A9C3	0160-4792	5	1	CAPACITOR-FXD 8.2PF +-.5PF 100VDC CER	28480	0160-4792
A9C4	0160-4822	2	9	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C5	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C6	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C7	0160-4788	9	1	CAPACITOR-FXD 18PF +-5% 100VDC CER 0+-30	28480	0160-4788
A9C8	0160-4802	8	1	CAPACITOR-FXD 82PF +-5% 100VDC CER 0+-30	28480	0160-4802
A9C9	0160-4805	1	1	CAPACITOR-FXD 47PF +-5% 100VDC CER 0+-30	28480	0160-4805
A9C10	0160-4814	2	1	CAPACITOR-FXD 150PF +-5% 100VDC CER	28480	0160-4814
A9C11	0160-4554	7	12	CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C12	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C13	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C14	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C15	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C16	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C17	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C18	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C19	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C20	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C21	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C22	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C23	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C24	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C25	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A9C26	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A9C27	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C28	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9C29	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A9C30	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A9CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	9N171	1N4148
A9CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	9N171	1N4148
A9CR3	1901-1070	9	1	DIODE-PIN 110V	28480	1901-1070
A9J1	1250-0590	6	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0590
A9J2	1250-0590	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0590
A9L1	08558-80012	7	1	COIL FREQ ADJUST	28480	08558-80012
A9L2	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10%	28480	9100-2250
A9L3	9100-2255	4	2	INDUCTOR RF-CH-MLD 470NH 10%	28480	9100-2255
A9L4	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10%	28480	9100-2255
A9L5	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10%	28480	9100-2891
A9L6	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10%	28480	9100-2251
A9L7	9100-2259	8	1	INDUCTOR RF-CH-MLD 1.5UH 10%	28480	9100-2259
A9L8	9100-3562	8	2	INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A9L9	9100-3562	8		INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A9L10	9140-0398	8	1	INDUCTOR RF-CH-MLD 12UH 5%	28480	9140-0398
A9L11	9100-3548	0	3	INDUCTOR RF-CH-MLD 470NH 5%	28480	9100-3548
A9L12	9100-3548	0		INDUCTOR RF-CH-MLD 470NH 5%	28480	9100-3548
A9L13	9100-3548	0		INDUCTOR RF-CH-MLD 470NH 5%	28480	9100-3548
A9L14	9100-2249	8	1	INDUCTOR RF-CH-MLD 150NH 10%	28480	9100-2249
A9Q1	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A9Q2	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A9Q3	1853-0036	2	1	TRANSISTOR PNP SI PD=310MW FT=250MHZ	27014	2N3906
A9Q4	1854-1032	2	1	TRANSISTOR NPN SI PD=2.5W	04713	MRF581
A9Q5	1854-0215	1	1	TRANSISTOR NPN SI TO-92 PD=350MW	04713	2N3904
A9R1	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A9R2	0757-0394	0	4	RESISTOR 51.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A9R3	0757-0424	7	2	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1101-F
A9R4	2100-3123	0	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	73138	89PR500
A9R5	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9R6	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A9R7	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	CT4-1/8-T0-75R0-F
A9R8	0698-7227	6	1	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-F
A9R9	0698-7203	8	1	RESISTOR 42.2 1% .05W F TC=0+-100	24546	C3-1/8-T0-42R2-F
A9R10	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A9R11	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A9R12	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A9R13	0757-0294	9	2	RESISTOR 17.8 1% .125W F TC=0+-100	19701	5033R-1/8-T0-17R8-F
A9R14	0757-0294	9		RESISTOR 17.8 1% .125W F TC=0+-100	19701	5033R-1/8-T0-17R8-F
A9R15	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1101-F
A9R16	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-F
A9R17	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-F
A9R18	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-F
A9R19	0757-0405	4	2	RESISTOR 162 1% .125W F TC=0+-100	24546	CT4-1/8-T0-162R-F
A9R20	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	CT4-1/8-T0-162R-F
A9R21	0757-0394	0		RESISTOR 51.1 1% 0.125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A9R22 0757-0419	~~0698-8442~~	9	1	RESISTOR ~~887~~ 1% 0.125W F TC=0+-100 681Ω	24546	CT4-1/8-T0-237R-F
A9R23 0698-0082	~~0757-0422~~	5	2	RESISTOR ~~909~~ 1% 0.125W F TC=0+-100 4.4 Ω	24546	CT4-1/8-T0-909-F
A9R24 0698-3154	~~0698-6154~~	0	1	RESISTOR ~~4.22K~~ 1% 0.125W F TC=0+-100 4.22 KΩ	24546	CT4-1/8-T0-4.2K-F
A9R25	0757-0418	7		RESISTOR 511 1% 0.125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
A9R26	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R27	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	CT4-1/8-T0-75R0-F
A9R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A9R29 0698-7211	~~0698-7205~~	0		RESISTOR ~~51.1~~ 1% 0.125W F TC=0+-100 909Ω		
A9U1	0955-0084	5	1	U-WAVE MIXER 500 MHZ MAX	28480	0955-0084
A9VR1	1902-3104	6	1	DIODE-ZNR 5.62V 5% DO-35 PD=.4W	28480	1902-3104
A9VR2	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A9Y1	0410-1854	5	1	SAWR 299.9 MHZ	28480	0410-1854

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
				See Note front of manual		
A10	08590-60056	6	1	2ND IF BOARD ASSEMBLY	28480	08590-60055
A10C1	0121-0457	9	3	CAPACITOR-V TRMR-PSTN .8-8.5PF 750V	18736	TP9
A10C2	0121-0457	9		CAPACITOR-V TRMR-PSTN .8-8.5PF 750V	18736	TP9
A10C3	0121-0457	9		CAPACITOR-V TRMR-PSTN .8-8.5PF 750V	18736	TP9
A10C4	0160-3878	6	4	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10C6	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10C8	0160-2236	8	1	CAPACITOR-FXD 1PF +-.25PF 500VDC CER	28480	0160-2236
A10C9	0160-2250	6	5	CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A10C10	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10C11	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A10C12	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A10C13	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A10C14	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A10C15	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A10J1	1250-0690	8	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10J2	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10L1	9100-2247	4	1	INDUCTOR RF-CH-MLD 100NH 10%	28480	9100-2247
A10L2	08558-80005	9	1	COIL PAR TANK	28480	08558-80005
A10Q1	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A10Q2	~~5086-4218~~ 1854-1142	7	1	~~TRANSISTOR NPN SI TO-18 PD=360MW~~	28480	5086-4218
A10R1	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A10R2	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1782-F
A10R3	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A10R4	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-F
A10R5	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A10T1	08558-80003	6	1	COIL B.P. FILTER	28480	08558-80003

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11	08590-60050	1	1	BANDWIDTH FILTER BOARD ASSEMBLY	28480	08590-60050
A11C1	0160-4832	4	38	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C2	0180-0127	2	1	CAPACITOR-FXD 1UF +-20% 50VDC CER	28480	0160-0127
A11C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C8	0160-2207	3	2	CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A11C9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C10	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C12	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C13	0160-4822	2	3	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A11C14	0160-2249	3	2	CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A11C15	0121-0069	7	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A11C16*	0160-0134	1	4	CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A11C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C19	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C20*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A11C21	0160-0437	7	2	CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A11C22	0160-4835	7	3	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A11C23	0121-0038	0	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A11C24	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C25	0121-0563	8	2	CAPACITOR-V TRMR-CER 3.5-10PF 160V	52763	7R/S-TRIK0302448404
A11C26	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C28	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C29	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A11C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C31	0160-4831	3	1	CAPACITOR-FXD 4700PF +-10% 100VDC CER	28480	0160-4831
A11C32	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A11C33	0160-2207	3		CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A11C34	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C35	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C37	0160-2249	3		CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A11C38	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A11C39	0160-2997	8	2	CAPACITOR-FXD 8.2PF +-.5PF 1KVDC CER	28480	0160-2997
A11C40	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C41	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A11C42	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C43*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A11C44	0160-0437	7		CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A11C45	0121-0038	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A11C46	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A11C47	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C48	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C49	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C50	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C51	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C52	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C53	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C54	0121-0563	8		CAPACITOR-V TRMR-CER 3.5-10PF 160V	52763	7R/S-TRIK0302448404
A11C55	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C56	0160-2997	8		CAPACITOR-FXD 8.2PF +-.5PF 1KVDC CER	28480	0160-2997
A11C60	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C61	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C62	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C63	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C64*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11C65	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C66	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C67	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C68	0160-2258	4	1	CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30	28480	0160-2258
A11C69	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11C73	0121-0452	4	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A11C74	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A11C75	0160-4788	8		CAPACITOR-FXD 18PF		
A11CR1	1901-0047	8	6	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR2	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR3	1901-1070	9	5	DIODE-PIN 110V	28480	1901-1070
A11CR4	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A11CR5	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A11CR6	1901-0535	9	5	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A11CR8	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A11CR9	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR10	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR11	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A11CR12	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A11CR13	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A11CR15	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A11CR16	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A11CR17	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A11L1	9140-0112	2	1	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A11L2	9100-1641	0	1	INDUCTOR RF-CH-MLD 240UH 5%	28480	9100-1641
A11L3	9140-0114	4	2	INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A11L4	9100-1624	9	3	INDUCTOR RF-CH-MLD 30UH 5%	28480	9100-1624
A11L5	9140-0179	1	2	INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A11L6	9100-2813	0	2	INDUCTOR 385NH 5% .312D-INX1.018LG-IN	28480	9100-2813
A11L7	9140-0399	7	2	INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A11L8	9140-0178	0	1	INDUCTOR RF-CH-MLD 12UH 10%	28480	9140-0178
A11L9	9100-1619	2	2	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A11L10	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A11L11	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5%	28480	9100-1624
A11L12	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A11L13	9140-0399	7		INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A11L14	9100-1620	5	1	INDUCTOR RF-CH-MLD 15UH 10%	28480	9100-1620
A11L15	9100-2813	0		INDUCTOR 385NH 5% .312D-INX1.018LG-IN	28480	9100-2813
A11L16	9140-0144	0	2	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0144
A11L17	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5%	28480	9100-1624
A11L18	9100-1619	2		INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A11L19	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0144
A11MP2	08559-00025	5	1	BAFFLE INDUCTOR	28480	08559-00025
A11Q1	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A11Q2	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A11Q3	1853-0007	7	5	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A11Q4	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A11Q5	1855-0267	5	2	TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A11Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A11Q7	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A11Q8	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A11Q9	1855-0267	5		TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A11Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A11R1	0757-0444	1	3	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A11R2	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-F
A11R3	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	CT4-1/8-T0-111-F
A11R4	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R5	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	CT4-1/8-T0-162R-F
A11R6	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A11R7*	0698-8821	8	1	RESISTOR 5.62 1% .125W F TC=0+-100	28480	0698-8821
A11R8	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A11R9	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-6811-F
A11R10	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11R11	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A11R12	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1622-F
A11R13	0698-0092	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A11R14	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A11R15	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A11R16	0757-0419	0	2	RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-F
A11R17	0698-3442	9	2	RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-F
A11R18	0698-3154	0	2	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-F
A11R19	0698-3156	2	3	RESISTOR 14.7K 1% 0.125W F TC=0+-100	24546	CT4-1/8-T0-1471-F
A11R20	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R21	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R23*	0757-0447	4	3	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1622-F
A11R24	0757-0199	3	2	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-F
A11R25	0698-3452	1	1	RESISTOR 147K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1473-F
A11R26	2100-3162	7	1	RESISTOR-TRMR 200K 10% C SIDE-ADJ 17-TRN	73138	89PR200K
A11R27	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A11R28	0757-0443	0	2	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-F
A11R29	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-F
A11R30	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	CT4-1/8-T0-111-F
A11R31	2100-3052	4	1	RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	73138	89PR50
A11R32*	0757-0462	3	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7502-F
A11R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R34	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-F
A11R35	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-9091-F
A11R36	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-F
A11R37	0757-0418	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
A11R38	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-T0-215R-F
A11R39	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-F
A11R40	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-F
A11R41	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-F
A11R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R43	0698-3156	2		RESISTOR 14.7K 1% 0.125W F TC=0+-100	24546	CT4-1/8-T0-1471-F
A11R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R45	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A11R46	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A11R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A11R48*	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1622-F
A11R49	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A11R50	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A11R51	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A11R52	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-F
A11R53	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A11R54	0757-0418	7		RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
A11R55	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A11R56*	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1621-F
A11R57	0757-0180	2	2	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A11R58	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3481-F
A11R59	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A11R60	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3831-F
A11R61	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1101-F
A11VR1	1902-0049	1	1	DIODE-ZNR 6.81V 5% DO-35 PD=.4W	28480	1902-0049
A11Y1	0410-0776	8	4	CRYSTAL-QUARTZ 21.4 MHZ HC-25/U-HLDR	28480	0410-0776
A11Y2	0410-0776	8		CRYSTAL-QUARTZ 21.4 MHZ HC-25/U-HLDR	28480	0410-0776
A11Y3	0410-0776	8		CRYSTAL-QUARTZ 21.4 MHZ HC-25/U-HLDR	28480	0410-0776
A11Y4	0410-0776	8		CRYSTAL-QUARTZ 21.4 MHZ HC-25/U-HLDR	28480	0410-0776

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12	08590-60039	6	1	STEP GAIN BOARD ASSEMBLY	28480	08590-60039
A12C1	0160-2055	9	16	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C12	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A12C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C16	0160-3457	7	3	CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A12C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C19	0160-3457	7		CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A12C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C22	0160-3457	7		CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A12C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C24	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A12C25	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A12CR1	1901-0047	8		DIODE		
A12CR2	1901-0047	8		DIODE		
A12CR4	1901-1070	9	3	DIODE-PIN 110V	28480	1901-1070
A12CR5	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A12CR6	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A12L1	9140-0179	1	7	INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L2	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L3	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L4	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L6	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L7	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L8	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10%	28480	9140-0179
A12L9	9100-2260	1	1	INDUCTOR RF-CH-MLD 1.8UH 10%	28480	9100-2260
A12L10	9140-0158	8	1	INDUCTOR RF-CH-MLD 1UH 10%	28480	9140-0158
A12Q1	1853-0007	7	4	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A12Q2	1854-0345	8	3	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q3	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A12Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q5	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A12Q6	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q7	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A12R1	2100-3103	6	2	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A12R2	2100-3103	6		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A12R3	2100-3054	8	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A12R4	2100-3081	5	1	RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	73138	89PR500K
A12R12	0698-3444	1	4	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A12R15	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A12R16	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A12R19	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-6191-F
A12R20	0757-0279	0	4	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A12R21	0698-3162	0	4	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A12R22	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A12R23	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A12R24	0757-0395	1	3	RESISTOR 56.2 1% .125W F TC=0+-100	24546	CT4-1/8-T0-56R2-F
A12R25	0757-0280	3	6	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A12R26	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	CT4-1/8-T0-562R-F
A12R27	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A12R28	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A12R29	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A12R30	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	CT4-1/8-T0-56R2-F
A12R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A12R32	0757-0420	3	2	RESISTOR 750 1% .125W F TC=0+-100	24546	CT4-1/8-T0-751-F
A12R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A12R34	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A12R35	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A12R36	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	CT4-1/8-T0-56R2-F
A12R37	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A12R38	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	CT4-1/8-T0-751-F
A12R39	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A12R40	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A12R47	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A12R48	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A12R49	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A12R50	0698-3447	4	1	RESISTOR 422 1% 0.125W F TC=0+-100	24546	CT4-1/8-TC-422R-F
A13				SAME AS A11 ASSEMBLY		

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14	08590-60075	9	1	LOG AMP BOARD ASSEMBLY	28480	08590-60075
A14C1	0160-4554	7	65	CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C2	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A14C3	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C4	0160-4084	8	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A14C5	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A14C6	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C7	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A14C8	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C9	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C10	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C11	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C12	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C14	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C15	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C16	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C17	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C18	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C19	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C20	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C21	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C22	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C23	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C24	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C25	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C26	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C27	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C28	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C29	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C30	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C31	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C32	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C33	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C34	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C36	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C37	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C38	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C39	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C40	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C41	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C42	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C43	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C44	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C45	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C46	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C47	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C48	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C49	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C50	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C51	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C52	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C53	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C54	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C55	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C56	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C57	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C58	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C59	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C60	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C61	0160 4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C62	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14C63	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C64	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C65	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C66	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C67	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C68	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C69	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C70	0160-4519	4	1	CAPACITOR-FXD 9.1PF +-.5PF 200VDC CER	28480	0160-4519
A14C71	0140-0195	2	1	CAPACITOR-FXD 130PF +-5% 300VDC MICA	72136	DM15F131J0300WV1CR
A14C72	0160-4386	3	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A14C73	0160-3872	0	1	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A14C74	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A14C77	0160-4554	7		CAPACITOR-FXD .01UF + 20% 50VDC CER	28480	0160-4554
A14CR1	1910-0016	0	1	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A14CR2	1901-0050	3	2	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A14CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A14CR6	1901-1085	6	17	DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR7	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR8	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR9	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR10	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR11	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR12	1901-1070	9	7	DIODE-PIN 110V	28480	1901-1070
A14CR13	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR14	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR15	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR16	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR17	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR18	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR19	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR20	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR21	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR22	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	9N171	1N4148
A14CR23	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR24	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR25	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR26	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR27	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14CR28	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR29	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A14CR30	1901-1085	6		DIODE-SCHOTTKY SM SIG	28480	5082-2835
A14L1	9100-1618	1	1	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A14L2	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0144
A14L3	9140-0105	3	2	INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A14L4	9100-1619	2	2	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A14L5	9100-1619	2		INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A14L6	9140-0114	4	3	INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A14L7	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A14L8	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A14L9	9140-0112	2	1	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A14L10	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A14L11	9100-1627	2	1	INDUCTOR RF-CH-MLD 39UH 5%	28480	9100-1627
A14L12	9100-1629	4	1	INDUCTOR RF-CH-MLD 47UH 5%	28480	9100-1629
A14L13	9100-1622	7	1	INDUCTOR RF-CH-MLD 24UH 5%	28480	9100-1622
A14L14	9100-2257	6	1	INDUCTOR RF-CH-MLD 820NH 10%	28480	9100-2257
A14Q1	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A14Q2	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A14Q3	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A14Q4	1853-0015	7	5	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q5	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q6	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A14Q7	1854-0019	3	12	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q8	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q9	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q10	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14Q11	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q12	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q13	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q14	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q15	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q16	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q17	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q18	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q19	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14Q20	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
		0		1854-0457		
A14Q21	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A14Q22	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q24	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q25	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A14R1	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1331-F
A14R2	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R3	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A14R4	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A14R5	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-F
A14R6	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R7	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A14R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R9	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4222-F
A14R10	2100-2633	5	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	73138	82PAR1K
A14R11	~~0698-3157~~			RESISTOR 3.83K		0698-3153
A14R12	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A14R13	0757-0401	0	8	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R14	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-6192-F
A14R15	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A14R16	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A14R17	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-9092-F
A14R18	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1782-F
A14R19	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A14R20	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-F
A14R21	2100-2489	9	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	82PAR5K
A14R22	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1963-F
A14R23	2100-2514	1	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	73138	82PAR20K
A14R24	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R25	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R26	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A14R27	2100-2489	9		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	82PAR5K
A14R28	0757-0346	2	14	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R30	2100-2522	1	3	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R33	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R34	2100-2521	0	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	73138	82PAR2K
A14R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R36	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R37	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R38	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2871-F
A14R39	2100-2520	9	1	RESISTOR-TRMR 50 20% C SIDE-ADJ 1-TRN	73138	82PAR50
A14R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A14R41	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-6191-F
A14R42	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5621-F
A14R43	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1622-F
A14R44	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	CT4-1/8-T0-751-F
A14R45	0698-3444	1	8	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R46	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-F
A14R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R48	0698-3150	6	4	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R49	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2610-F
A14R50	0757-0279	0	4	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14R51	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R52	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R53	0757-0444	1	6	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R54	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R55	0757-0440	7	7	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R56	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R57	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R58	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R59	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R60	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R62	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R63	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R64	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R65	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R66	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R67	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R68	0698-8958	2	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A14R69	2100-2892	6	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	73138	82PAR1M
A14R70	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R71	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A14R72	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R73	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-F
A14R74	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R75	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R76	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R77	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R78	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R79	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R80	0757-0289	2	8	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R81	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R82	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R83	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R84	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R85	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A14R86	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R87	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R88	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	82PAR10K
A14R89	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R90	0757-0403	2	2	RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A14R91	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R92	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R93	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3831-F
A14R94	0698-3150	8		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2371-F
A14R95	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R96	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R97	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R98	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-1332-F
A14R99	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R100	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A14R101	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3831-F
A14R102	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A14R103	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R104	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A14R105	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A14R106	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	CT4-1/8-T0-562R-F
A14R107	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-F
A14R108	0698-3434	9	1	RESISTOR 34.8 1% .125W F TC=0+-100	28480	0698-3434
A14R109	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	CT4-1/8-T0-90R9-F
A14R110	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	CT4-1/8-T0-619R-F
A14R111	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A14R112	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R113	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A14R114	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1782-F
A14R115	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14R116	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	CT4-1/8-T0-619R-F
A14R117	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7501-F
A14R118	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A14R129	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-F
A14R130	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A14R131	0757-0402	1	1	RESISTOR 110 1% 0.12W F TC=0+-100	24546	CT4-1/8-TC-111-F
A14R132	0757-0280			RESISTOR 8.19K 1% 0.125W F TC=0+-100		
A14R133	0686-7212	9	2	RESISTOR 100 1% 0.05W F TC=0+-100	24546	C3-1/8-TC-100R-F
A14R134	0686-7212	9		RESISTOR 100 1% 0.05W F TC=0+-100	24546	C3-1/8-TC-100R-F
A14R135	0686-7277	6		RESISTOR 51.1K 1% 0.12W F TC=0+-100	24546	C3-1/8-TC-5112-F
A14R136	0686-7277	6		RESISTOR 51.1K 1% 0.12W F TC=0+-100	24546	C3-1/8-TC-5112-F
A14R137	0686-7277	6		RESISTOR 51.1K 1% 0.12W F TC=0+-100	24546	C3-1/8-TC-5112-F
A14U1	1826-0092	3	2	IC OP AMP GP DUAL TO-99 PKG	28480	1826-0092
A14U2	1826-0092	3		IC OP AMP GP DUAL TO-99 PKG	28480	1826-0092
A14VR1	1902-0901	5	1	DIODE-ZNR 6.4V 1% DO-35 PD=0.4W TC= +-0.046%	28480	1902-0901
A14W1	8159-0005	0	1	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S	08590-60003	4	1	IF MOTHERBOARD ASSEMBLY	28480	08590-60003
A1SC1	0160-4832	4	10	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC2	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC10	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1SC11	0160-4835	7	5	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1SC12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1SC13	0180-3444	4	4	CAPACITOR-FXD 39UF+100-10% 40VDC AL	28480	0180-3444
A1SC14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1SC15	0180-3444	4		CAPACITOR-FXD 39UF+100-10% 40VDC AL	28480	0180-3444
A1SC16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1SC17	0180-3444	4		CAPACITOR-FXD 39UF+100-10% 40VDC AL	28480	0180-3444
A1SC18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1SC19	0180-3444	4		CAPACITOR-FXD 39UF+100-10% 40VDC AL	28480	0180-3444
A1SC20	0180-2216	6	1	CAPACITOR-FXD 350UF+75-10% 16VDC AL	56289	30D357G016DH2
A1SCR1	1901-0036	5	1	DIODE-HV RECT 1KV 600MA DO-29	28480	1901-0036
A1SCR3	1901-0743	1	3	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A1SCR4	1901-0743	1		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A1SCR5	1901-0743	1		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A1SDS1	1990-0485	6	5	LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A1SDS2	1990-0485	6		LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A1SDS3	1990-0485	6		LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A1SDS4	1990-0485	6		LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A1SDS5	1990-0485	6		LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A1SE1	1970-0096	2	1	SURGE VOLTAGE PROTECTOR	28480	1970-0096
A1SJ1	1251-7300	1	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-7300
A1SJ2	1252-1488	2	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	00779	2-103168-3
A1SJ3	1252-1684	4	1	CONN-POST TYPE .156-PIN-SPCG 8-CONT	28480	1252-1684
A1SJ4	1252-1683	3	1	CONN-POST TYPE .156-PIN-SPCG 9-CONT	28480	1252-1683
A1SJ5	1251-2969	8	2	CONNECTOR-PHONO SINGLE PHONO JACK; DIP	28480	1251-2969
A1SJ6	1251-2969	8		CONNECTOR-PHONO SINGLE PHONO JACK; DIP	28480	1251-2969
A1SJ7	1252-0025	5	1	CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1252-0025
A1SJ8	1251-8507	2	1	CONN-UTIL MT-LK 6-CKT 6-CONT	28480	1251-8507
A1SJ9	1251-0472	4	2	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A1SJ10	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A1SJ11	1251-1365	6	4	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A1SJ12	1251-1365	6		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A1SJ13	1251-1365	6		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A1SJ14	1251-1365	6		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A1SL1	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10%	28480	9140-0158
A1SL2	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10%	28480	9140-0158
A1SL3	9100-2247	4	1	INDUCTOR RF-CH-MLD 100NH 10%	28480	9100-2247
A1SL4	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10%	28480	9140-0158
A1SL5	9140-0328	2	4	INDUCTOR 10UH 10% .625D-INX1.125LG-IN	28480	9140-0328
A1SL6	9140-0328	2		INDUCTOR 10UH 10% .625D-INX1.125LG-IN	28480	9140-0328
A1SL7	9140-0328	2		INDUCTOR 10UH 10% .625D-INX1.125LG-IN	28480	9140-0328
A1SL8	9140-0328	2		INDUCTOR 10UH 10% .625D-INX1.125LG-IN	28480	9140-0328
A1SR1	0698-3180	2	1	RESISTOR 68 2% 2W MO TC=0+-200	28480	0698-3180
A1SR2	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-F
A1SR3	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	CT4-1/8-T0-56R2-F
A1SR4	0757-0854	7	2	RESISTOR 56.2K 1% .5W F TC=0+-100	28480	0757-0854
A1SR5	0757-0854	7		RESISTOR 56.2K 1% .5W F TC=0+-100	28480	0757-0854

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A15R6	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-F
A15R7	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	CT4-1/8-T0-287R-F
A15R8	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A15R9	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1331-F
A15R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A15R11	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1331-F
A15R12	0764-0013	5	1	RESISTOR 56 5% 2W MO TC=0+-200	28480	0764-0013
A15U1	1990-1038	6	1	OPTO-ISOLATOR LED-PKSTR IF=60MA-MAX	28480	1990-1038
A15VR1	1902-0551	1	1	DIODE-ZNR 6.2V 5% PD=1W IR=10UA	28480	1902-0551

See introduction to this section for ordering information
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Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16	08590-60002	3	1	PROCESSOR A/D BOARD ASSEMBLY	28480	08590-60002
A16C1	0160-4835	7	12	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C7	0160-4832	4	40	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C9	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A16C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C12	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C13	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C19	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C20	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C21	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C22	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C23	0180-0116	1	9	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C24	0160-0163	6	1	CAPACITOR-FXD .033UF +-10% 200VDC POLYE	28480	0160-0163
A16C25	0160-0155	6	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	28480	0160-0155
A16C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C28	0160-4674	1	2	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4674
A16C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C31	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C32	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C33	0160-4807	3	1	CAPACITOR-FXD 33PF +-5% 100VDC CER 0+-30	28480	0160-4807
A16C34	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C35	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C37	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C38	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C39	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C40	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C41	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C42	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C43	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C44	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C45	0160-4790	3	1	CAPACITOR-FXD 12PF +-5% 100VDC CER 0+-30	28480	0160-4790
A16C46	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A16C47	0160-4882	2	1	CAPACITOR-FXD 1000PF +-2.5% 160VDC POLYP	28480	0160-4882
A16C48	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C49	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C50	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C51	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C52	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C53	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C54	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C55	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C56	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C57	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C58	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C59	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C60	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2

See introduction to this section for ordering information
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Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16C81	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X903582
A16C82	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C83	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C84	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C85	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C86	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C87	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16C88	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X903582
A16C89	0180-1735	2	1	CAPACITOR-FXD .22UF+-10% 35VDC TA	56289	1500224X9035A2
A16C70	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X903582
A16CR1	1901-0050	3	7	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR6	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR7	1901-0539	3	1	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A16CR8	1901-1131	3	1	DIODE-SCHOTTKY SM SIG	28480	5082-2810
A16CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR11	1990-0858	4	16	LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR12	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR13	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR14	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR15	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR16	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR17	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR18	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR19	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR20	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR21	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR22	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR23	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR24	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR25	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16CR26	1990-0858	4		LED LAMP LUM-INT=150UCD IF=25MA-MAX	28480	1990-0858
A16J1	1251-7389	6	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-7389
A16J2	1252-1470	6	2	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	5188-692-3
A16J3	1252-1470	6		CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	5188-692-3
A16J4	1252-1283	9	1	CONN-POST TYPE .100-PIN-SPCG 24-CONT	28480	1252-1283
A16J5	1251-5839	5	1	CONNECTOR 2-PIN M POST TYPE	28480	1251-5839
A16J6	1251-6254	2	2	CONNECTOR-SGL CONT RTANG-F	28480	1251-6254
A16J7	1251-6254	2		CONNECTOR-SGL CONT RTANG-F	28480	1251-6254
A16J8	1251-5417	7	2	CONNECTOR 40-PIN M POST TYPE	28480	1251-5417
A16J9	1251-5417	7		CONNECTOR 40-PIN M POST TYPE	28480	1251-5417
A16L1	9100-1631	8	1	INDUCTOR RF-CH-MLD 56UH 5%	28480	9100-1631
A16Q1	1853-0036	2	2	TRANSISTOR PNP SI PD=310MW FT=250MHZ	27014	2N3906
A16Q2	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	27014	2N3906
A16Q3	1855-0420	2	3	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A16Q4	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A16Q5	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A16Q6	1855-0414	4	1	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A16Q7	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A16Q8	1855-0675	9	1	TRANSISTOR MOSFET N-CHAN E-MODE SI	04713	MPF6660
A16R1	0698-7236	7	11	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R2	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R3	0698-7253	8	11	RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R4	0698-7260	7	9	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R5	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R6	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R7	0698-7205	0	3	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A16R8	0698-7231	2	1	RESISTOR 619 1% .05W F TC=0+-100	24546	C3-1/8-T0-619R-F
A16R9	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A16R10	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16R11	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R12	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R13	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R14	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R15	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R16	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A16R17	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R18	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R19	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R20	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R21	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R22	0698-7219	6	2	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A16R23	0698-7196	8	1	RESISTOR 21.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-21R5-F
A16R24	0698-6362	8	3	RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
A16R25	0698-7219	6		RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A16R26	0698-6347	9	2	RESISTOR 1.5K .1% .125W F TC=0+-25	28480	0698-6347
A16R27	0698-7248	1	5	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A16R28	0698-7214	1	1	RESISTOR 121 1% .05W F TC=0+-100	24546	C3-1/8-T0-121R-F
A16R29	0698-7284	5	4	RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-F
A16R30	0698-7277	6	3	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A16R31	0698-7225	4	1	RESISTOR 348 1% .05W F TC=0+-100	24546	C3-1/8-T0-348R-F
A16R32	0698-7259	3	1	RESISTOR 8.25K 1% .05W F TC=0+-100	24546	C3-1/8-T0-8251-F
A16R33	0698-7255	0	1	RESISTOR 6.19K 1% .05W F TC=0+-100	24546	C3-1/8-T0-6191-F
A16R34	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A16R35	0698-7220	9	1	RESISTOR 215 1% .05W F TC=0+-100	24546	C3-1/8-T0-215R-F
A16R36	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A16R37	0698-6320	9	1	RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A16R38	0698-6360	6	3	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R39	0698-7247	0	1	RESISTOR 2.87K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2871-F
A16R40	0698-7221	0		RESISTOR 237 1% 0.05W F TC=0+-100		C3-1/8-TO-237R-F
A16R41	0698-6317	3	4	RESISTOR 500 .1% .125W F TC=0+-25	03888	PME55-1/8-T9-500R-B
A16R42	0698-6317	3		RESISTOR 500 .1% .125W F TC=0+-25	03888	PME55-1/8-T9-500R-B
A16R43	0698-6362	8		RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
A16R44	0698-6317	3		RESISTOR 500 .1% .125W F TC=0+-25	03888	PME55-1/8-T9-500R-B
A16R45	0698-7202	7	2	RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T0-38R3-F
A16R46	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T0-38R3-F
A16R47	0698-7218	5	1	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-F
A16R48	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R49	0698-7250	5	1	RESISTOR 3.83K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3831-F
A16R50	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R51	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A16R52	0698-6362	8		RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
A16R53	0698-6347	9		RESISTOR 1.5K .1% .125W F TC=0+-25	28480	0698-6347
A16R54	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-F
A16R55	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A16R56	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A16R57	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A16R58	0757-0439	1		RESISTOR 1.62K 1% 0.12W	24546	C3-1/8-TO-1621-F
A16R59	0698-7245	8	1	RESISTOR 2.37K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2371-F
A16R60	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R61	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-F
A16R62	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A16R63	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-F
A16R64	0698-6317	3		RESISTOR 500 .1% .125W F TC=0+-25	03888	PME55-1/8-T9-500R-B
A16R65	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R66	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A16R67	0698-6831	4	1	RESISTOR 2.5K .1% .125W F TC=0+-25	28480	0698-6831
A16R68	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R69	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A16R70	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R71	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R72	0698-7221	0	1	RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-F
A16R73	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R74	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R76	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16R77	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A16R78	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R79	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16R80	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R81	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A16R82	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-F
A16U1	1820-2102	8	3	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A16U2	1820-2875	0	2	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS646NT
A16U3	1820-2875	0		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS646NT
A16U4	1818-3499	3	2	IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	28480	1818-3499
A16U5	1818-3183	2	2	IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	54013	HM6264LP-15
A16U6	SEE PAGE 4-24		1	PROGRAMMED EPROM	28480	08590-80068
A16U7	SEE PAGE 4-24		1	PROGRAMMED EPROM	28480	08590-80069
A16U8	1820-3401	2	1	IC BFR TTL ALS OR QUAD 2-INP	01295	SN74ALS1032AN
A16U9	1820-1208	3	4	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A16U10	1820-1201	6	1	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A16U11	1810-0286	4	3	NETWORK-RES 16-DIP 10.0K OHM X 15	11236	761-1-R10K
A16U12	1820-2505	5	1	IC-MPU; CLK FREQ=8MHZ, INSTRUCTION	04713	MC68000L8
A16U13	1820-1212	9	1	IC FF TTL LS J-K NEG-EDGE-TRIG	01295	SN74LS112AN
A16U14	1820-3185	9	2	IC SCHMITT-TRIG CMOS/74HC INV HEX	27014	MM74HC14N
A16U15	1820-1216	3	4	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A16U16	1820-1417	6	2	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS26N
A16U17	1813-0129	0	1	IC OSC HYBRID	34344	SP62358
A16U18	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A16U19	1820-3789	9	4	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG COM	27014	MM74HC574N
A16U20	1820-3789	9		IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG COM	27014	MM74HC574N
A16U21	1818-3499	3		IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	28480	1818-3499
A16U22	1818-3183	2		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	54013	HM6264LP-15
A16U23	SEE PAGE 4-24		1	PROGRAMMED EPROM	28480	08590-80070
A16U24	SEE PAGE 4-24		1	PROGRAMMED EPROM	28480	08590-80071
A16U25	1251-4787	2	1	SHUNT-DIP 8 POS	28480	1251-4787
A16U26	1820-1204	9	1	IC GATE TTL LS NAND DUAL 4-INP	01295	SN74LS20N
A16U27	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A16U28	1820-1300	6	1	IC SHF-RGTR TTL LS R-S PRL-IN PRL-OUT	01295	SN74LS195AN
A16U29	1820-1194	6	2	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A16U30	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
A16U31	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A16U32	1820-1197	9	2	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS08N
A16U33	1853-0077	1	3	TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2222P
A16U34	1810-0037	3	1	NETWORK-RES 16-DIP 1.0K OHM X 8	11236	761-3-R1K
A16U35	1826-0756	9	1	IC COMPARATOR GP QUAD 14-DIP-C PKG	04713	LM339J
A16U36	1820-1194	6		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A16U37	1820-1112	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A16U38	1810-0205	7	2	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81-R4.7K
A16U39	1820-1417	6		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS26N
A16U40	1820-3425	0	1	IC-PROGRAMMABLE INTERVAL TIMER,DC-10MHZ	34649	D8254-2
A16U41	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A16U42	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A16U43	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A16U44	1853-0077	1		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2222P
A16U45	1826-1045	8	1	IC OP AMP H-SLEW-RATE 8-DIP-C PKG	34371	HA7-2515-5
A16U46	1826-1178	8	1	SAMPLE AND HOLD 14 -CERDIP	34371	HA1-5320-5
A16U47	1826-1522	8	1	A/D 12-DGT 28-CERDIP HYB	24355	AD574AJ (SELECTED)
A16U48	1810-0286	4		NETWORK-RES 16-DIP 10.0K OHM X 15	11236	761-1-R10K
A16U49	1820-3789	9		IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG COM	27014	MM74HC574N
A16U50	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A16U51	1820-1430	3	2	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	SN74LS161AN
A16U52	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A16U53	1810-0286	4		NETWORK-RES 16-DIP 10.0K OHM X 15	11236	761-1-R10K
A16U54	1820-2024	3	2	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A16U55	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A16U56	1820-1851	2	1	IC ENCDR TTL LS	34335	AM74LS148N
A16U57	1820-3440	8	1	IC-PARALLEL INTERFACE/TIMER/8MHZ/MC68000	04713	MC68230L8 1820-3832
A16U58	1810-0205	7		NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81-R4.7K
A16U59	1810-0204	6	2	NETWORK-RES 8-SIP 1.0K OHM X 7	11236	750-81-R1K
A16U60	1810-0204	6		NETWORK-RES 8-SIP 1.0K OHM X 7	11236	750-81-R1K

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16U61	1826-1478	1	1	IC OP AMP PRCN 8-DIP-C PKG	06665	OP15-223Z
A16U62	1858-0032	8	1	TRANSISTOR ARRAY 14-PIN PLSTC DIP	3L586	CA3146E
A16U63	1858-0077	1		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2222P
A16U64	1826-0609	8	1	IC MULTIPLXR ANLG 16-DIP-C PKG	06665	MUX08FQ
A16U65	1820-3789	9		IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG COM	27014	MM74HCS74N
A16U66	1820-1997	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	34335	AM74LS374AP
A16U67	1820-1436	3		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	SN74LS161AN
A16U68	1820-2024	3		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A16U69	1820-1207	2	1	IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
A16U70	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A16U71	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A16U72	1820-3195	9		IC SCHMITT-TRIG CMOS/74HC INV HEX	27014	MM74HC14N
A16VR1	1902-3104	6	1	DIODE-ZNR 5.62V 5% DO-35 PD=.4W	28480	1902-3104
A16W1	8159-0005	0	3	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A16W2	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A16W3	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A17	08590-60070		1	VIDEO BOARD ASSEMBLY	28480	08590-60070
A17C1	0160-4835	7	6	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17C2	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A17C3	0160-4832	4	11	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17C10	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17C13	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C14	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17C16	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A17CR1	1901-0539	3				
A17J1	1252-1469	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A17J2	1252-0718	3	1	CONN-POST TYPE .100-PIN-SPCG 5-CONT	28480	1252-0718
A17J3	1251-6254	2	1	CONNECTOR-SGL CONT RTANG-F	28480	1251-6254
A17Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A17Q2	1854-0215	1		TRANSISTOR		
A17R1	0757-0399	5	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	CT4-1/8-T0-82R5-F
A17R2	0757-0388	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	CT4-1/8-T0-75R0-F
A17R3	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
A17R4	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2610-F
A17R5	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A17R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A17R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A17R8	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A17R9	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A17R10	0698-8820			RESISTOR 4.64K 1% 0.12W		
A17R11	0698-3444	1		RESISTOR 316 1% 0.12W		
A17R12	0698-0082	7		RESISTOR 464		
A17R13	0757-0278	9		RESISTOR 1.78K		
A17U1	1820-0535	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A17U2 1820-5636	~~1820-1460~~	0	1	IC ADVANCED CRT CONTROLLER/DMA INT/8MHZ	54111	HD63484-8
A17U3	1820-2102	8	2	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A17U4	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A17U5	08590-60001	4	1	PROGRAMMED PAL	28480	08590-60001
A17U6	1810-0533	4	2	NETWORK-RES 16-DIP 33.0 OHM X 8	28480	1810-0533
A17U7	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A17U8	1820-1194	6	1	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A17U9	1818-3214	0	4	IC TMS4416-15NL	28480	1818-3214
A17U10	1820-1922	8	2	IC SHF-RGTR TTL LS PRL-IN SERIAL-OUT	01295	SN74LS166AN
A17U11	1810-0533	4		NETWORK-RES 16-DIP 33.0 OHM X 8	28480	1810-0533
A17U12	1818-3214	0		IC TMS4416-15NL	28480	1818-3214
A17U13	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A17U14	1820-1201	6	1	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A17U15	1818-3214	0		IC TMS4416-15NL	28480	1818-3214
A17U16	1820-1922	8		IC SHF-RGTR TTL LS PRL-IN SERIAL-OUT	01295	SN74LS166AN
A17U17	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A17U18	1818-3214	0		IC TMS4416-15NL	28480	1818-3214
A17U19	1820-2208	5		IC GATE TTL LS OR QUAD 2-INP	01295	
A17U20	1813-0245	1	1	XTAL-CLOCK-OSCILLATOR 25-MHZ 0.05% TTL	28480	1813-0245

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18	08590-60068	1	1	HP-IB I/O BOARD ASSEMBLY	28480	08590-60068
A18C1	0160-4835	7	3	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18J1	1252-1469	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A18J2	1252-1065	5	1	CONN-POST TYPE .100-PIN-SPCG 24-CONT	28480	1252-1065
A18R1	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A18R2	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A18R3	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A18R4	0698-8820	7		RESISTOR 4.64K 1% 0.12W		
A18U1	1820-3513	7	1	IC TRANSCEIVER TTL S INSTR-BUS IEEE-488	27014	DS75161AN
A18U2	1820-3431	6	1	IC TRANSCEIVER TTL S INSTR-BUS IEEE-488	27014	DS75160AN
A18U3	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A18U4	1820-2548	6	1	IC-GENERAL PURPOSE INTERFACE BUS ADAPTER	28480	1820-2548
A18U5	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A19	08590-60018	1	1	HP-IB CONNECTOR ASSY	28480	08590-60018
A20 MODULE	9135-0270	2	1	FILTER-LINE OPERATING VOLTAGE:250 V MAX	54307	FN 365-4/01
A20 F1	2110-0703			Fuse		

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A21	08590-60012	5	1	RS-232 I/O BOARD ASSEMBLY	28480	08590-60012
A21C1	0160-4835	7	6	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A21C7	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A21J1	1252-1489	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A21J2	1252-1036	0	1	CONN-POST TYPE .100-PIN-SPCG 26-CONT	28480	1252-1036
A21R1	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21R2	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21R3	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A21U1	1820-3823	0	1	IC-ASYNCHRONOUS COMM.INTERFACE	27014	INS8250AN
A21U2	1820-3322	6	1	IC DRVR DTL COMM EIA RS-232C QUAD	04713	MC1488P
A21U3	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A21U4	1820-3321	5	1	IC RCVR DTL COMM EIA RS-232C QUAD	04713	MC1489AP
A21U5	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
A21U6	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A21U7	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A21U8	1826-0300	8	1	IC V RGLTR TO-39	07263	79M12HC
A22	08590-60019	2	1	RS 232 CONNECTOR ASSY	28480	08590-60019
	08590-60052			HPIB RETROFIT KIT		
	08590-60053			HPIL RETROFIT KIT		
	08590-60054			RS 232 RETROFIT KIT		

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23	08590-60013	6	1	HP-IL I/O BOARD ASSEMBLY	28480	08590-60013
A23C1	0180-0374	3	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X902082
A23C2	0160-4835	7	3	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A23C3	0160-4800	6	1	CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A23C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A23C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A23J1	1252-1469	3	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	00779	103292-2
A23J2	1252-1287	3	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	28480	1252-1287
A23L1	9100-1631	8	1	INDUCTOR RF-CH-MLD 56UH 5%	28480	9100-1631
A23R1	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A23U1	1LB3-0003	9	1	HP-IL CHIP	28480	1LB3-0003
A23U2	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A23U3	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A23U4	1810-0851	7	1	NETWORK-RDC 10 PIN SIP; R1=R2=15K+-5%	28480	1810-0851
A23U5	9100-4226	3	1	TRANSFORMER	28480	9100-4226
A24	08590-60020	5	1	HP-IL CBL CONNECTOR ASSY	28480	08590-60020

A26

See introduction to this section for ordering information
*Indicates factory selected value

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
	08590-60010	3	1	COVER ASSY INSTRUMENT	28480	08590-60010
	08590-00004	9	1	COVER INSTRUMENT	28480	08590-00004
	08590-40002	1	2	SPACER FOOT-REAR	28480	08590-40002
	0900-0024	8	4	O-RING .145-IN-ID .07-IN-XSECT-DIA SIL	51633	AS568-007 (SILICONE-60 DURO)
*	1460-2164	8	2	SPRING COMPRESSION	28480	1460-2164
	2190-0587	3	4	WASHER-LK HLCL 5.0 MM 5.1-MM-ID	28480	2190-0587
	5001-8728	4	2	PLATE BACKUP	28480	5001-8728
	5021-6332	4	1	PLATE HANDLE	28480	5021-6332
	5021-6343	7	2	GEAR RING	28480	5021-6343
	5021-6344	8	2	SOCKET-GEAR	28480	5021-6344
	5041-3937	1	2	FOOT REAR	28480	5041-3937
	5041-3990	6	1	HANDLE	28480	5041-3990
	5041-3991	7	2	TRIM CAP-HANDLE	28480	5041-3991
	~~08590-60021~~	~~9~~	~~1~~	~~PAD ASSY-MATCHING 75 OHM~~	~~28480~~	~~08590-60021~~
J1	08590-60090	9	1	PAD ASSY-MATCHING	28480	08590-60090
	0515-1114		6	SCREW		
	0515-1218		4	SCREW		

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CABLES (SEE FIGURE 3-2)		
A3W1	08590-60034	1	1	CABLE ASSY, ATTENUATOR	28480	08590-60034
A5W1	08590-60033	0	1	CABLE ASSY, ANALOG POWER	28480	08590-60033
A6W1	08590-60035	2	1	CABLE ASSY, YIG POWER	28480	08590-60035
A20W1	08590-60016	9	1	CABLE ASSY, LINE POWER (INCLUDES A20 PREWIRED)	28480	08590-60016
W1	08590-60024	9	1	CABLE ASSY, 1 LO OUTPUT	28480	08590-60024
W2	08590-60026	1	1	CABLE ASSY, CAL OUT	28480	08590-60026
W2	08590-60028	3	1	CABLE ASSY, CAL OUT	28480	08590-60028
W3	08590-60065	8	1	CABLE ASSY, PROBE POWER	28480	08590-60065
W4	08590-60023	8	1	CABLE ASSY, RF INPUT	28480	08590-60023
W5	~~5061-0020~~	3	1	WIRING ASSY, RPG	28480	~~5061-0020~~ 0960-0745
W6	08590-60014	7	1	CABLE ASSY, RIBBON 24C	28480	08590-60014
W7	08590-60021	6	1	CABLE ASSY, VIDEO	28480	08590-60021
W8	08590-20057	4	1	CABLE ASSY, ISOLATOR TO FIRST CONV	28480	08590-20057
W9	08590-20059	6	1	CABLE ASSY, LPF TO 2ND CONV.	28480	08590-20059
W10	08590-20007	4	1	CABLE ASSY, RF ATTEN - 1ST	28480	08590-20007
W11	08590-60022	7	1	CABLE ASSY, DC POWER	28480	08590-60022
W12	8120-4823	7	38	CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W13	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W14	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W15	08590-60025	0	1	CABLE ASSY, SECOND CONV-SEC. IF	28480	08590-60025
W16	08590-60027	2	1	CABLE ASSY, 2ND IF TO 3RD MIXER	28480	08590-60027
W17				SEE A18, A21 & A23 P/O REMOTE I/O ASSYS		
W18	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W19	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W20	8120-4823	7		CABLE ASSY, 2 PHONO 9.5	28480	8120-4823
W21	08590-20056	3	1	CABLE ASSY, YIG TO ISOLATOR	28480	08590-20056
W22	08590-20058	5	1	CABLE ASSY, FIRST CONV TO LPF	28480	08590-20058
W23	08590-60041	0	1	CABLE ASSY, INTENSITY POT	28480	08590-60041
W24	5062-0784	4	1	CABLE ASSY, LINE SWITCH	28480	5062-0784 #2722A02081 & BELOW
W25	08590-60017	0	1	CABLE ASSY, LINE SELECT	28480	08590-60017
W26	08590-60037	4		CABLE ASSY, CRT INTENSITY		
W24	5062-1998			#2722A02082 & ABOVE		

See introduction to this section for ordering information.
* Indicates factory selected value.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS-MAIN IPB (SEE FIGURE 3-1)		
1	0515-0808	9	8	SCREW-THD-RLG M4 X 0.7 12MM-LG PAN-HD	00000	ORDER BY DESCRIPTION
2	0515-0886	3	22	SCREW-MACH M3 X 0.5 6MM-LG PAN-HD	28480	0515-0886
3	0515-1125	5	4	SCREW-MACH M3 X 0.5 10MM-LG	28480	0515-1125
4	0515-1367	7	20	SCREW-MACH M4 X 0.7 8MM-LG 90-DEG-FLH-HD	28480	0515-1367
5	0515-1468 113	9	1	SCREW-MACH M3 X 0.5 45MM-LG PAN-HD	28480	0515-1468
6	0515-1666	9	2	SCREW-MACH M4 X 0.7 35MM-LG PAN-HD	28480	0515-1666
7	3050-0105	6	3	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
8	5001-5828	9	2	COVER, BANDWIDTH FILTER	28480	5001-5828
9	5001-8788	2	1	MAIN DECK		
10	08590-00006	1	1	SHIELD, CRT	28480	08590-00006
11	08590-00007	2	1	BRACKET, POWER SUPPLY	28480	08590-00007
12	08590-00008	3	1	BRACKET, MONITOR	28480	08590-00008
13	08590-60066	1	1	HP-IB I/O BOARD ASSEMBLY	28480	08590-60066
14	08590-00016	3	1	COVER, STEP GAIN	28480	08590-00016
15	08590-00017	4	1	COVER, LOG AMP	28480	08590-00017
16	08590-00018	5	1	COVER, 2ND IF	28480	08590-00018
17	08590-20019	8	2	FRAME, SIDE	28480	08590-20019
18	08590-40001	0	2	SUPPORT, POWER SUPPLY	28480	08590-40001
	0515-1585	1	2	SCREW, M4 16MM-LG PAN-HD		
19	08590-00027			COVER 3RD STD		
19	08590-11031			COVER 3RD 001		

See introduction to this section for ordering information.
*Indicates not shown on IPB.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS-FRONT PANEL ASSY (FIGURE 3-3)		
B1	5062-0036		1	FAN ASSY		
21	0370-3069	2	1	KNOB, ROUND .250 GY	28480	0370-3069
22	0370-3079	4	1	KNOB, ROUND .125 JG	28480	0370-3079
23	0510-1148	2	2	RETAINER-PUSH ON KB-TO-SHFT EXT	28480	0510-1148
24	0515-0894	3	9	SCREW-MACH M2.5 X 0.45 8MM-LG PAN-HD	28480	0515-0894
25	0515-0897	6	12	SCREW-MACH M3 X 0.5 8MM-LG PAN-HD	28480	0515-0897
26	0515-1622	7	4	SCREW-SKT-HD-CAP M4 X 0.7 8MM-LG	28480	0515-1622
27	0590-1251	8	3	NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD	00000	ORDER BY DESCRIPTION
28 (2827A + ABOVE)	1000-0823	8	1	FILTER CRT 5.2 X 4.2	28480	1000-0823 (0546)
29	2190-0016	3	2	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
*30	2190-0027	6	1	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
31	2950-0043	8	2	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
*32	2950-0072	3	1	NUT-HEX-DBL-CHAM 1/4-32-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
*33	3030-0007	5	2	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
*34	3050-0103	4	2	WASHER-FL MTLC NO. 12 .25-IN-ID	28480	3050-0103
35 *	5021-7460	5	1	FRAME, FRONT	28480	5021-7460 (5021-9920 #3228)
36	5041-3936	0	2	BUMPER TOPR/BOTL	28480	5041-3936
37	5041-3938	2	1	KEYPAD, RUBBER	28480	5041-3938
38	5041-3939	3	1	KEY, '0'	28480	5041-3939
39	5041-3940	6	1	KEY, '.'	28480	5041-3940
40	5041-3941	7	2	KEY, '1'	28480	5041-3941
41	5041-3942	8	2	KEY, '2'	28480	5041-3942
42	5041-3943	9	1	KEY, '3'	28480	5041-3943
43	5041-3944	0	1	KEY, '4'	28480	5041-3944
44	5041-3945	1	1	KEY, '5'	28480	5041-3945
45	5041-3946	2	1	KEY, '7'	28480	5041-3946
46	5041-3947	3	1	KEY, '8'	28480	5041-3947
47	5041-3948	4	1	KEY, 'BK SP'	28480	5041-3948
48	5041-3949	5	1	KEY, 'PK SEARCH'	28480	5041-3949
49	5041-3950	8	1	KEY, 'MKR-RIGHT ARROW'	28480	5041-3950
50	5041-3951	9	1	KEY, 'HOLD'	28480	5041-3951
51	5041-3954	2	2	KEY, '9'	28480	5041-3954
52	5041-3955	3	2	KEY, 'STEP'	28480	5041-3955
53	5041-3956	4	4	KEY, 'TERM'	28480	5041-3956
54	5041-3957	5	1	KEY, 'PRESET'	28480	5041-3957
55	5041-3960	0	1	KEY, 'FREQUENCY'	28480	5041-3960
56	5041-3961	1	1	KEY, 'SPAN'	28480	5041-3961
57	5041-3962	2	1	KEY, 'AMPLITUDE'	28480	5041-3962
58	5041-3964	4	1	KEY, 'SAVE'	28480	5041-3964
59	5041-3965	5	1	KEY, 'RECALL'	28480	5041-3965
60	5041-3967	7	1	KEY, 'AUTO COUPLE'	28480	5041-3967
61	5041-3974	6	1	KEY, 'DISPLAY'	28480	5041-3974
62	5041-3976	8	1	KEY, 'TRIG'	28480	5041-3976
63	5041-3984	8	2	BUMPER, TOPL/BOTR	28480	5041-3984
64	5041-3995	1	6	ACTUATOR, SOFTKEY	28480	5041-3995
65	5041-7251	0	1	KEY, 'PRINT'	28480	5041-7251
66	5041-7252	1	1	KEY, 'PLOT'	28480	5041-7252
67	5041-7253	2	1	KEY, 'CAL'	28480	5041-7253
68	5041-7254	3	1	KEY, 'CONFIG'	28480	5041-7254
69	5041-7255	4	1	KEY, 'LOCAL'	28480	5041-7255
70	5041-7256	5	1	KEY, 'MKR'	28480	5041-7256
71	5041-7257	6	1	KEY, 'SIG TRK'	28480	5041-7257
72	5041-7258	7	1	KEY, 'TRACE A'	28480	5041-7258
73	5041-7259	8	1	KEY, 'TRACE B'	28480	5041-7259
74	5041-7260	1	1	KEY, 'SWEEP-BU'	28480	5041-7260
75	5060-0467	6	1	CONNECTOR, MALE PROBE	28480	5060-0467
76 5041-8914	5062-0783	3	1	BEZEL ASSY, CRT	28480	5062-0783 OLD COLOR
*77	8160-0520	7	3	GASKET, EMI 3.97M DIA	28480	8160-0520
78	08590-00002	7	1	PANEL, FRONT DRESS (08590-00013, OPT 001)	28480	08590-00002
79	0960-0745			RPG		

* for serial nos. 2833A 03227 and below

See introduction to this section for ordering information.
*Indicates not shown on IPB.

Table 3-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS - REAR PANEL (FIGURE 3-4)		
81	0380-1900	9	4	SPACER-RND .75-IN-LG .18-IN-ID .25-IN-OD	28480	0380-0011
82	0510-1148	2	3	RETAINER-PUSH ON KB-TO-SHFT EXT	28480	0510-1148
83	0515-0898	7	1	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	28480	0515-0898
84	0515-1125	5	2	SCREW-MACH M3 X 0.5 10MM-LG	28480	0515-1125
85	0515-1668	9	4	SCREW-MACH M4 X 0.7 35MM-LG PAN-HD	28480	0515-1668
*86	0535-0025	4	2	NUT-HEX DBL-CHAM M3 X 0.5 2.4MM-THK	00000	ORDER BY DESCRIPTION
87	1250-1558	7	6	ADAPTER-COAX STR F-BNC F-RCA-PHONO	28480	1250-1558
*88	1251-2942	7	1	SCREW LOCK KIT-SUBMIN D CONN	28480	1251-2942
*89	2110-0703	7	2	FUSE 6.3A 250V NTD IEC	28480	2110-0703
*90	2190-0586	2	2	WASHER-LK HLCL 4.0 MM 4.1-MM-ID	28480	2190-0586
*91	3050-0893	9	2	WASHER-FL MTLC 4.0 MM 4.4-MM-ID	28480	3050-0893
92	0960-0309	5	1	FINGER GUARD	4N833	12601-43 UL VERSION
93	8160-0520	7	3	GASKET, EMI 3.97M DIA	28480	8160-0520
94 *	5001-8760	2	1	PANEL, REAR DRESS	28480	5001-8760
95 *	5021-5479	8	1	FRAME, REAR	28480	5001-8750
*96	08590-80012	7	1	COVER, 8590A POLY	28480	08590-80012
97	0535-0023	2	2	NUT-HEX DBL-CHAM M4 X 0.7 3.2MM-THK	00000	ORDER BY DESCRIPTION
98	5021-6391	5	2	SCREW, CONN HP-IB	28480	5021-6391
*99	08590-00021	0	2	COVER, HP-IL	28480	08590-00021
*100	08590-00022	1	1	RETAINER, HP-IL	28480	08590-00022
*101	08590-00021	0		BOARD ASSY, HP-IL I/O	28480	08590-00021
*102	08590-60022	7	1	CABLE ASSY, HP-IL	28480	08590-60022
				MISCELLANEOUS PARTS - RF SECTION (FIGURE 3-5)		
110	08590-00001		1	BRACKET, RF ISOLATOR 2-4.1 GHz		
	0960-0084					

* FOR SERIALS 2713A 01615 and below

Rear Frame 08590-20017

LINE MODULE 9135-0270

See introduction to this section for ordering information.
*Indicates not shown on IPB.

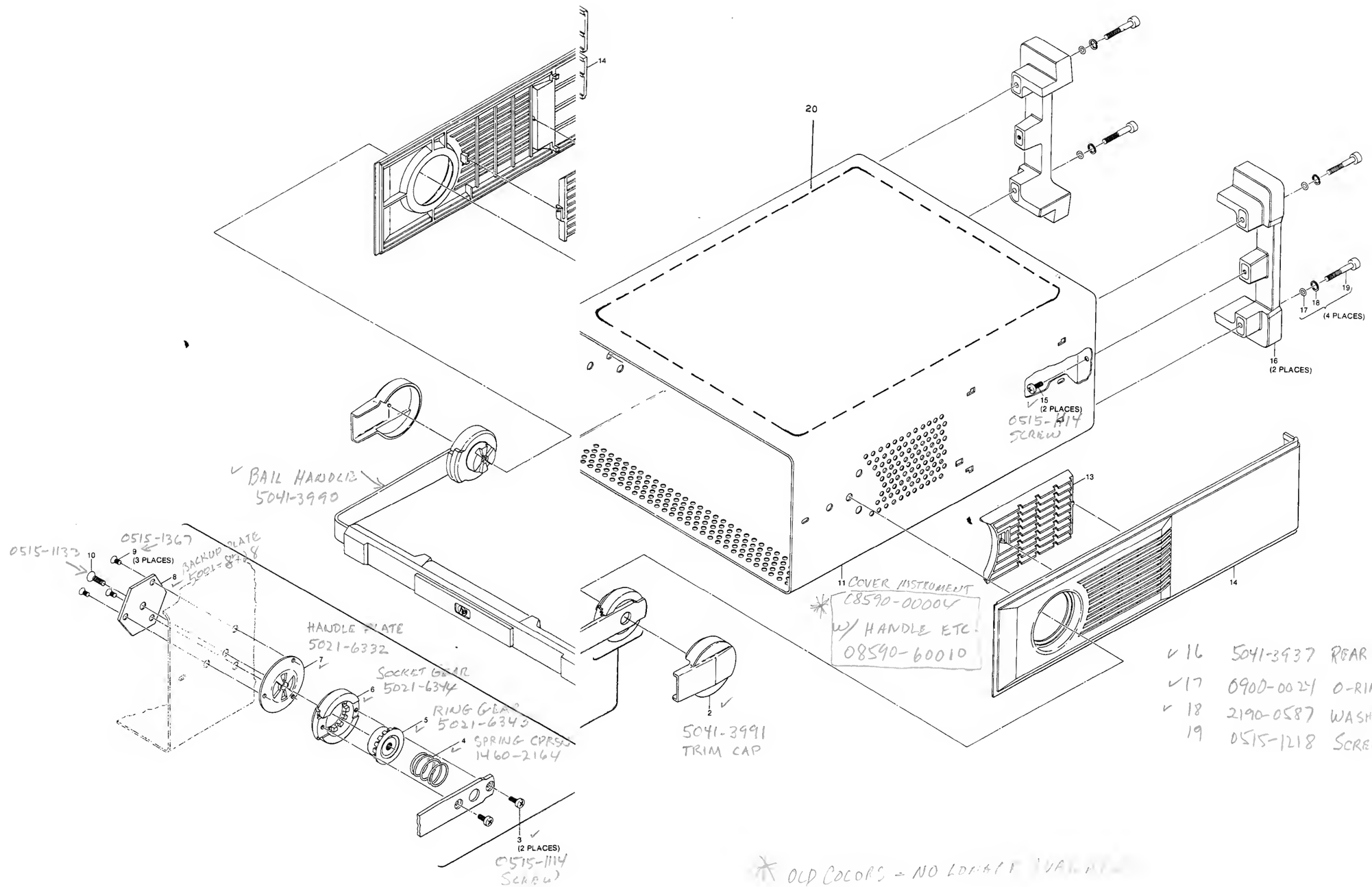


Figure 2-2 Instrument Cover Assembly Mechanical Parts 2-23

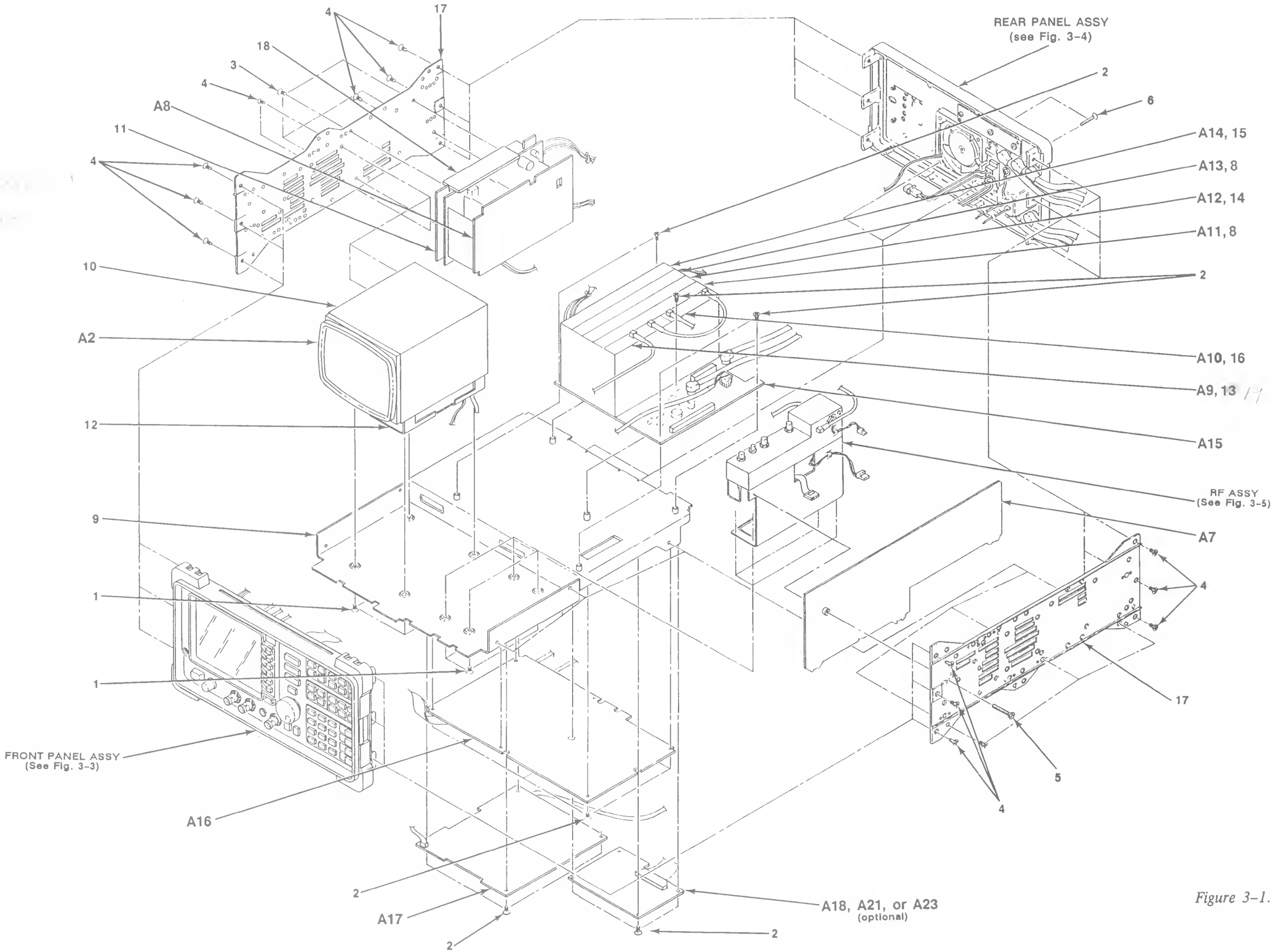


Figure 3–1. Main IPB

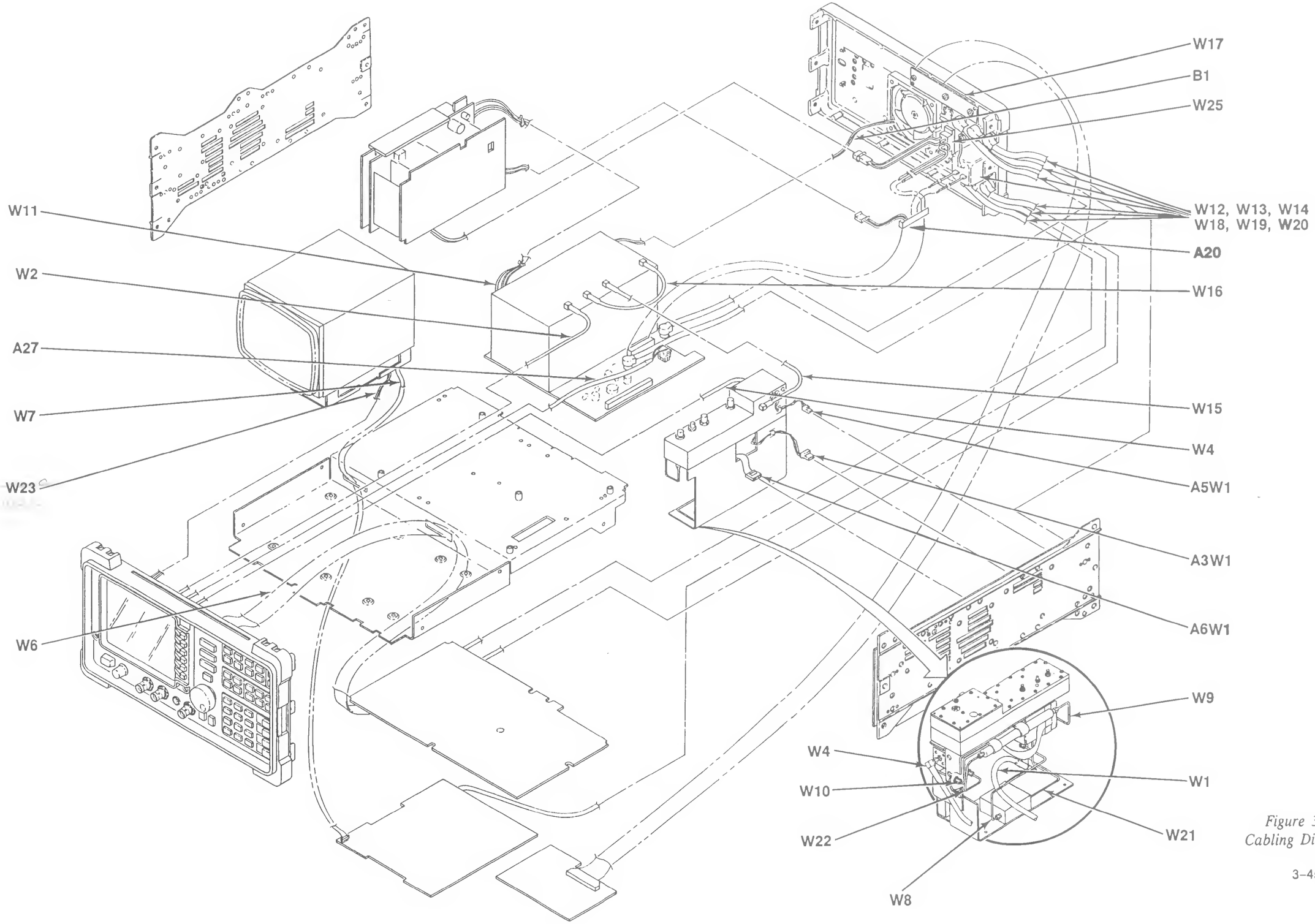


Figure 3–2.
Cabling Diagram

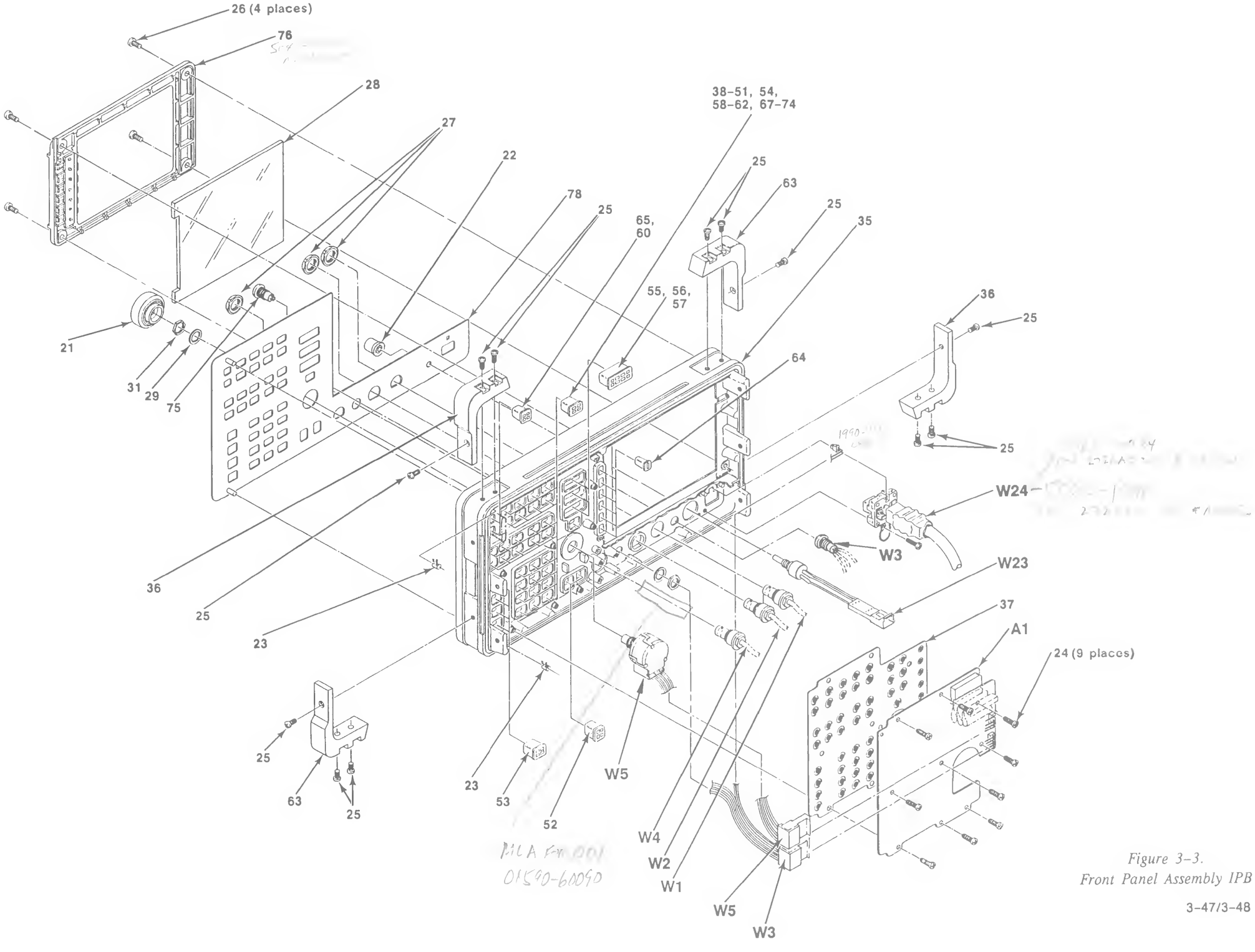


Figure 3–3.
Front Panel Assembly IPB

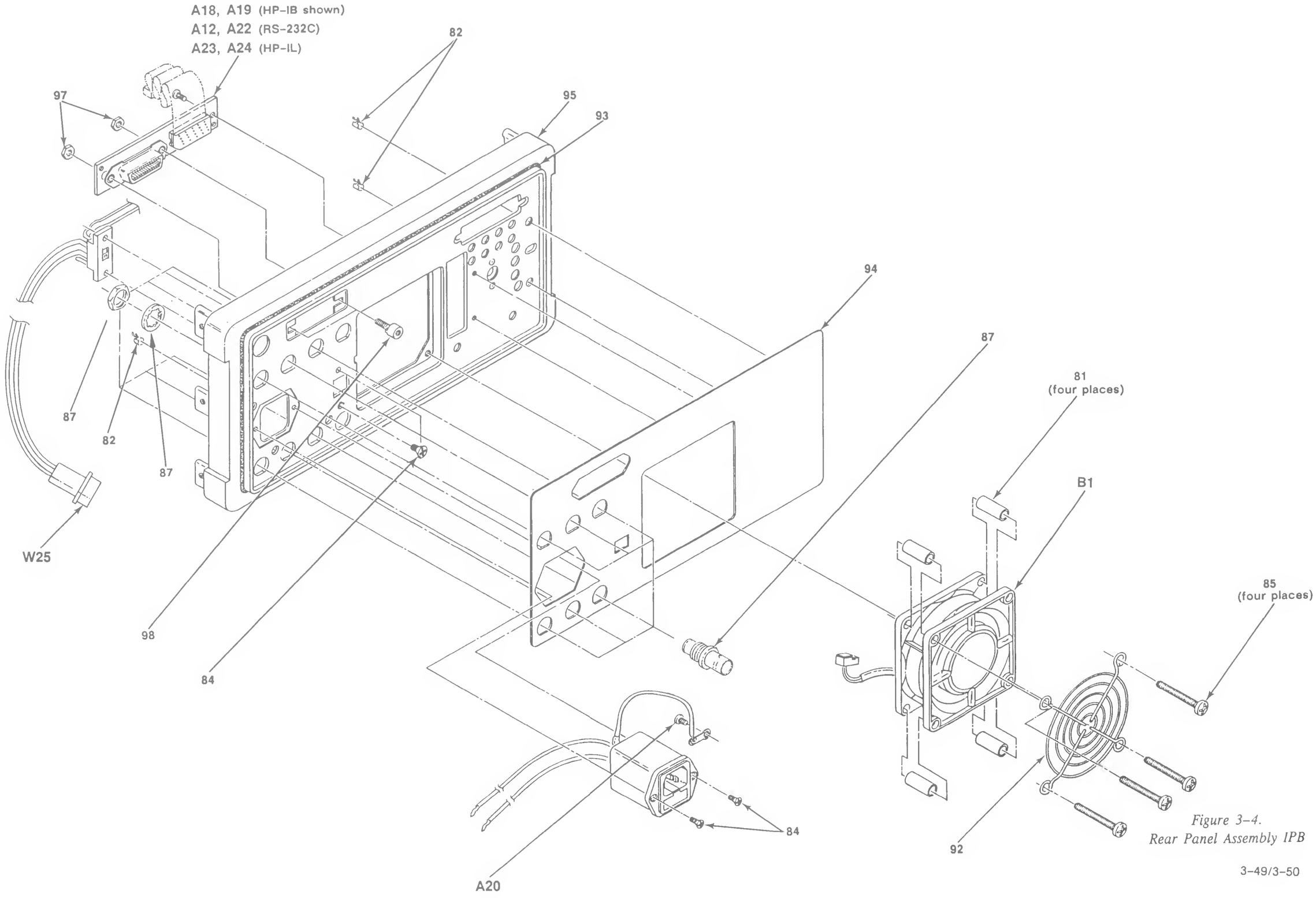


Figure 3–4.
Rear Panel Assembly IPB

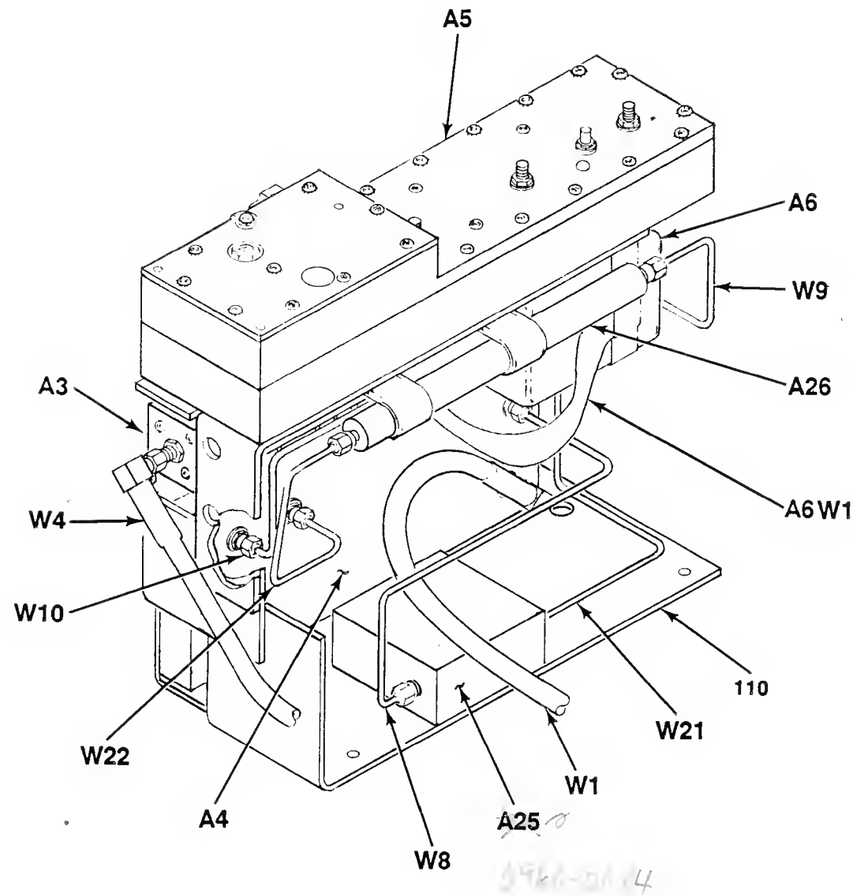


Figure 3–5. RF Section IPB

CHAPTER 4

TROUBLESHOOTING

Introduction

This chapter presents general procedures and troubleshooting hints to help you relate symptoms of analyzer problems to specific assemblies. Once you have identified a suspect assembly, you can find more information about that assembly in Chapter 5, Assembly Descriptions.

This chapter contains the following major sections:

- **Understanding Error Messages** presents information about the diagnostic messages that appear on the CRT screen and suggests assemblies to suspect.
- **Troubleshooting From the Front Panel** describes checks you can perform from the front panel. In some cases, these checks require measurements inside the unit to confirm the suspect assembly.
- **Locating RF/IF Problems** guides you through the fault isolation process within the RF/IF section. The block diagram at the end of the chapter is used with these instructions.
- **Troubleshooting a Dead Analyzer** explains the basic things to check when the analyzer is not working at all.
- **Calibration Data Problems** describes a particular kind of problem that can arise if the analyzer calibration constants are destroyed or altered. It also contains procedures for generating and entering new calibration constants. This should be done if the Attenuator Assembly A3 is replaced, or if a repair or adjustment is done that would affect the frequency response of the analyzer.

Test Equipment You'll Need

Table 1-2 lists the recommended test equipment for troubleshooting and repairing the analyzer. Although Hewlett-Packard equipment is recommended, other instruments may be used, provided they meet the critical specifications shown in Table 1-2.

Before Working on the Analyzer

Maintenance of the analyzer requires access to its interior. There are four things you must do *before* attempting any troubleshooting, repair, or adjustments inside the analyzer:

1. Remove its dust cover as follows:
   a. Disconnect the analyzer from ac power. Remove The 50 Ω load and/or any adapters on The front Panel Connectors.
   b. Carefully place the analyzer on its front panel, using a soft cloth or towel to protect the front panel from damage.
   c. Unscrew, but do not remove, the four screws attaching the cover to the instrument.
   d. Pull the cover off to the rear of the analyzer.
2. If the analyzer has been stored in an area where the ambient temperature is less than 0°C, allow the unit to come up to room temperature before proceeding (with no ac power applied).
3. Familiarize yourself with the safety symbols marked on the analyzer and with the general safety instructions and symbol definitions given in the front of this manual.
4. Read the rest of this chapter before you start troubleshooting the analyzer.

WARNING

The analyzer contains potentially hazardous voltages. Refer to the safety symbols provided on the analyzer and the general safety instructions in this manual before operating the unit with the cover removed. Failure to do so can result in severe or fatal injury.

Replacement Assemblies

The following assemblies are not component repairable. They are replaced as an assembly. Detailed assembly descriptions and component-level troubleshooting information for these assemblies are not included in Chapter 5, Assembly Descriptions.

- Display Module A2
- Attenuator Assembly A3
- First Local Oscillator A6
- Power Supply Module A8
- Connector Assemblies A19, A22, and A24 (for optional HP-IB, HP-IL, and RS-232 I/O ports)
- Line Module A20

- Fan Assembly B1
- Line Switch Assembly S1

Replacement assemblies for the above can be ordered from your nearest Hewlett-Packard office.

All other analyzer assemblies are component repairable. Replacement component parts or assemblies can be ordered from your nearest Hewlett-Packard support facility. Chapter 5, Assembly Descriptions, gives recommended troubleshooting times for each assembly. These times are given to assist you in making cost-effective repair-or-replace decisions.

After You Have Repaired the Analyzer

After you replace or repair any assemblies in the RF or IF sections of the analyzer, execute the related tests or adjustments to verify the analyzer performs to its specifications. If the analyzer must be recalibrated, perform all adjustment procedures listed in Table 2-1.

After you test the analyzer, do the analyzer (firmware) calibration procedure given in the HP 8590A Operating Manual. This ensures maximum measurement accuracy when the unit is placed into service.

Understanding Error Messages

The instrument controller executes diagnostic routines during power-up of the analyzer or when the [PRESET] key is pressed. Table 4-1 shows error message definitions and suspect assemblies for the error messages. Unless directed otherwise in the table, refer to Chapter 5, Assembly Descriptions, to troubleshoot the suspect assemblies.

Table 4-1. Spectrum Analyzer Hardware Error Message Definitions

Error Message	Meaning	Suspect Assemblies
ADC-GND FAIL	A failure occurred in the analog-to-digital converter.	Processor A/D A16 ±15V
ADC-TIME FAIL	A failure occurred in the analog-to-digital converter.	Processor A/D A16 +5V
ADC-2v FAIL	A failure occurred in the analog-to-digital converter.	Processor A/D A16 -12.6V, ±15V
CAL: FM SPAN SENS FAIL	The analyzer coud not set up span sensitivity of the YIG FM coil.	Analog Interface A7 FM Coil Driver
CAL: LINEAR DET FAIL	The linear calibration routine failed.	Attenuator calibration constant overwritten or missing. See Calibration Data Problems. or Step Gain A12 or Log Gain A14. See RF/IF Troubleshooting.
CAL: RES BW AMPL FAIL	Relative insertion loss resolution bandwidth is incorrect	See RF/IF Troubleshooting.
CAL: SPAN SENS FAIL	The calibration YIG main coil sensitivity routine failed	Analog Interface A7 Main Coil Driver
FAIL: ___	A specific hardware error was discovered during the analyzer's power-up. The 4-digit by 10-digit code indicates the error source (see Table 4-2)	See Table 4-2.

The following table and example explain how to interpret the failure codes annunciated on the CRT and the indications of the LEDs on the processor board A16. The failure codes on the CRT refer to errors found by the processor during the turn-on or preset self-test routines. Failure codes consist of two parts: a 4-digit segment and a 10-digit segment. For example:

Bad Front to rear on A16 Normal is 0300 Preset 1300

FAIL: **1330** **0000000000**

4-digit segment — 10-digit segment

The 4-digit segment indicates the component/circuit that failed as shown in Table 4-2.

Table 4-2. Failure Codes for 4-Digit Segment

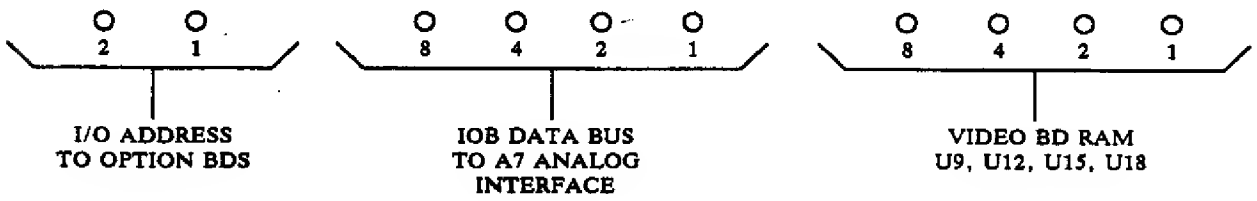
Digits From Example	Digit Value	LEDs on A16 (3)		Circuit Tested	Reference Designator	Notes
Most significant digit:						
1	8	1	15	Video Ram	U9, U12, U15, U18	(1)
	4	2	14	I/O Bus Address		(1)
	2	3	13	Processor	U12	
	1	4	12	68230	U57	
3	8	5	11	I/O Bus	Odd byte (to A7)	
	4	6	10	I/O Bus	Even byte (to A7)	
	2	7	9	Ram Odd FF4000	Not used	(2)
	1	8	8	Ram Even FF4000	Not used	(2)
3	8	9	7	RAM Odd FF8000	U5	
	4	10	6	RAM Even FF8000	U22	
	2	11	5	EEPROM Odd	U4	
	1	12	4	EEPROM Even	U21	
Least significant digit:						
0	8	13	3	ROM Odd B LSB	U6	FIRMWARE
	4	14	2	ROM Even B MSB	U23	
	2	15	1	ROM Odd A LSB	U7	
	1	16	0	ROM Even A MSB	U24	

Notes:

(1) See 10-digit segment for more information.
(2) These LEDs are on during normal operation.
(3) A16 has a row of test LEDs. These LEDs indicate the same error as the CRT Fail code.

F = 15
E = 14
D = 13
C = 12
B = 11
A = 10

The 10-digit segment gives the I/O address, the data bus or the video board RAM. It is divided as shown below:



Therefore, `FAIL: 1330 0000000000` would be interpreted as follows:

1 (MSD) is LED12, for the 68230 IC.
3 is RAM at FF4000. This is the normal code.
3 is EEPROM checksum failure.
0 (LSD) means the ROMs are okay (no failure).

The 10-digit segment is all zeros, since there was no failure affecting the I/O address or data bus or the video board RAM.

`FAIL: 1310 . . ., 1320 . . .`, or `1330 0000000000` is a fairly common error, usually indicating some bad data was picked up by the EEPROM. Normal operation (calibrated) can be restored by pressing SAVE 1, then rerunning the CAL FREQ and CAL AMPTD routines in firmware. Remember to press CAL STORE after running these two calibration routines.

1310 . . . and 1320 . . . are indicative of a EEPROM failure
replace the corresponding EEPROM

Troubleshooting From the Front Panel

CAUTION

IMMEDIATELY unplug the analyzer from ac power mains if the unit shows any of the following fault symptoms:

a. Smoke and/or audible noise from inside the unit.

b. No response of any kind when unit is plugged into ac power mains and turned on.

c. The unit's ac power fuse blows, or a circuit breaker/fuse on the ac mains blows. .

These potentially serious faults must be rectified before proceeding. Refer to Troubleshooting a Dead Analyzer.

The following steps can be done only if your analyzer has none of the conditions indicated in the note above. Once a suspect assembly has been identified, refer to Chapter 5, Assembly Descriptions, unless directed otherwise.

1. Plug the analyzer into the ac power line and press the LINE switch to ON. If the analyzer is operating normally, the fan will operate, and the CRT display will show a grid and trace with notations and soft key labels.

2. If the fan does not operate, check that all of the green LEDs on the IF Motherboard A15 are lit. If none is lit, the power supply on A15 may be defective. If the LED for the +15-Vdc supply is lit, the fan itself probably is defective.

3. If the display does not light at all with the INTENSITY control fully clockwise, or the monitor's display is distorted, check the +12V supply to the Display Module A2 at A17J2 pin 4 on the Video Board A17.

   If the +12V supply is low, verify that the analyzer is:

   1. a serial number above 500, or

   2. a serial number below 500 that has not had the new power supply installed in it, or

   3. a serial number below 500 that has had the new power supply installed as well as the accompanying change to the IF Motherboard (see IF Motherboard Assembly Descriptions, page 5-93).

If your instrument meets any of the above qualifications, check for a loading problem with the +12V supply. If the +12V supply is good, use an oscilloscope to check the following:

1. 19.2-kHz signal (HSYNC) at A17J2 pin 5,

2. 60-Hz signal (VSYNC) at A17J2 pin 2, and

3. presence of a signal (VIDEO) at A17J2 pin 3 (GND is A17J2 pin 1).

If these signals are wrong or missing, suspect the Video Board (A17).

If these signals are good, connect the CAL OUTPUT to the RF INPUT of the analyzer. Connect the Y input of an oscilloscope to AUX VIDEO OUTPUT and the X input to SWEEP OUTPUT. If you obtain a display that looks like Figure 4-1a without the annotation, the Display Module is defective.

4. If an error message appears on the display, see the previous section, "Understanding Error Messages".

5. If indications are normal, connect the CAL OUTPUT (299.9 MHz) signal on the front panel to the RF INPUT connector. Press [PRESET]. The CRT should look similar to Figure 4-1.

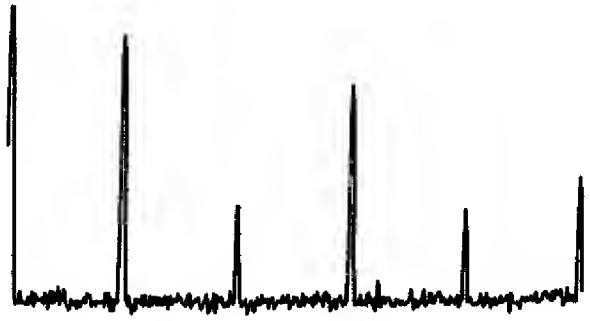


Figure 4–1a. Normal Oscilloscope or CRT Display

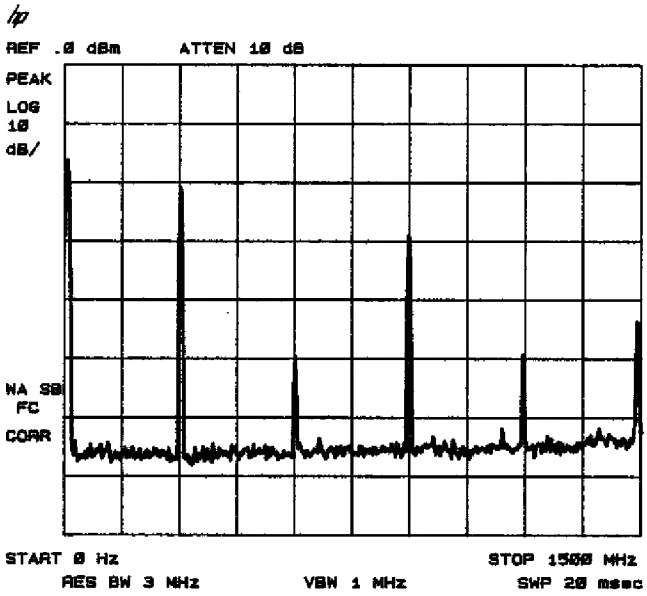


Figure 4–1b. ~~CAL Data Display Sample~~ Typical Display with Cal signal applied

6. If no signal trace is displayed or if the display is incorrect, check the CAL OUTPUT signal by connecting a frequency counter to the front panel connector. If there is no 299.9–MHz signal, the local oscillator (LO) in the Third Converter A9, may be defective.

7. If the selected center frequency or span is incorrect, refer to the Troubleshooting Hints for the Analog Interface assembly in Chapter 5. Check the 1st LO OUTPUT on the front panel using a power meter. The signal should be +14 dBm ±2 dB.

8. With the CAL OUTPUT signal connected to the RF INPUT on the front panel, select reference levels from 0 dBm to -50 dBm in 10 dB steps, for example:

   AMPLITUDE [LOG dB/DIV] 1 0 –dB

   The displayed CAL signal trace amplitude should vary in 10 dB steps per the selected reference levels.

9. If the readings from Step 8 are abnormal, put the Analog Interface A7 on an extender board. Check the signals IFG 1 through 6 at the Analog Interface connector A7J1, pins 24, 23, and 44. Compare the states with the reference level control states shown in Table 4-3. If the states are incorrect, suspect the Analog Interface. If the states are correct, suspect the Step Gain Amplifier A12.

Table 4-3. Reference Level Control States

Reference Level Settings with Input Attenuation			Log Gain			Step Gain		
			20	10	10	20	20	10 dB
Total IF Gain	Reference Level	Mode Log/Lin	6	5	4	3	2	1 IFG
			13	12	11	10	9	8 IOB
0	0	Log & Lin	0	0	0	0	0	0
10	-10	Log & Lin	0	0	0	0	0	1
20	-20	Log & Lin	0	0	0	0	1	0
30	-30	Log & Lin	0	0	0	0	1	1
40	-40	Log & Lin	0	0	0	1	1	0
50	-50	Log & Lin	0	0	0	1	1	1
60	-60	Lin	0	0	1	1	1	1
70	-70	Lin	0	1	1	1	1	1
80	-80	Lin	1	0	1	1	1	1
90	-90	Lin	1	1	1	1	1	1

+8.5
0

47 48 50 44 23 24 PIN

~ +10.8 0

~ -7.8 1

10. Press:

    PEAK SEARCH [NEXT RIGHT]

    SIGNAL TRACK

    SPAN 100 MHz

    AMPLITUDE [ATTEN] 0 dB

    Select from 0 to -60 dBm in 10 dB steps using the reference level up-arrow key. The attenuator should be heard clicking and the signal peak should drop in 10 dB steps. This exercises the attenuator through all its steps.

11. If indications from Step 10 are abnormal, check these pins on connector A7J4 of the Analog Interface:
    - Pin 2 10 dB pad
    - Pin 3 20 dB pad
    - Pin 4 30 dB attenuator pad

    When selected, the line should have an inductive spike toward ground. If the signals are correct, the attenuator probably is defective; otherwise suspect the Analog Interface.

12. Determine if the analyzer has any of the I/O options installed: HP-IB (A18), HP-IL (A23), or RS-232 (A21). If you suspect a failure in the I/O circuits, follow these steps:

    a. Connect a suitable printer or plotter to the interface connector.

    b. Ready the printer/plotter for operation. Set addresses, baud rate, etc.

    c. Press the [PRESET] key.

    d. After the preset operation has completed, tune the analyzer to the 299.9 MHz CAL OUTPUT signal using a resolution bandwidth of 1 MHz.

    e. Press the COPY [PRNT] or COPY [PLOT] key, as applicable.

    The currently displayed trace should be the output to the printer/plotter. If this is not the case, suspect the I/O board as being defective.

NOTE: Disconnect any controller on the HP-IB, HP-IL, or RS-232 bus before printing.

Locating RF/IF Problems

This section provides information for assembly-level fault isolation. Once a suspect assembly has been identified, refer to the appropriate section of Chapter 5, Assembly Descriptions, unless directed otherwise.

The information on the Troubleshooting Block Diagram, Figure 4-4 (located at the back of this chapter) forms the basis of fault isolation. A power meter and power sensor, or another spectrum analyzer (if available), is needed to measure the test points shown. Analyzer settings for the measurements are the [PRESET] conditions with CAL connected to the RF input.

The following troubleshooting hints should be considered:

1. To determine whether the fault is in the RF section or IF section, press [PRESET] and check for a ≈-13 dBm, 321.3 MHz IF signal at A9J1 of the ~~Second~~ Third Converter, A9. If this signal is present, the RF section is probably okay.

2. If the fault is in the IF Section, run the calibration amplitude and frequency tests to help determine whether the fault is in the Bandwidth Filter boards A11 and A13, the Step Gain board A12, or the Log Amplifier board A14. Press:

   [CAL AMPTD]

   [CAL FREQ]

   If these tests generate error messages, the messages are explained in Understanding Error Messages or the Error Messages Appendix of the accompanying Installation Manual. Visually monitor these tests to determine where they fail.

   To check an individual BW setting, press:

   [TRACE A] [VIEW A]

   [MENU1] [3 db POINTS]

   This will read out the bandwidth at the particular setting.

3. If you suspect a tuning stability problem, check the output of the First LO A6 for excessive noise on the CRT:

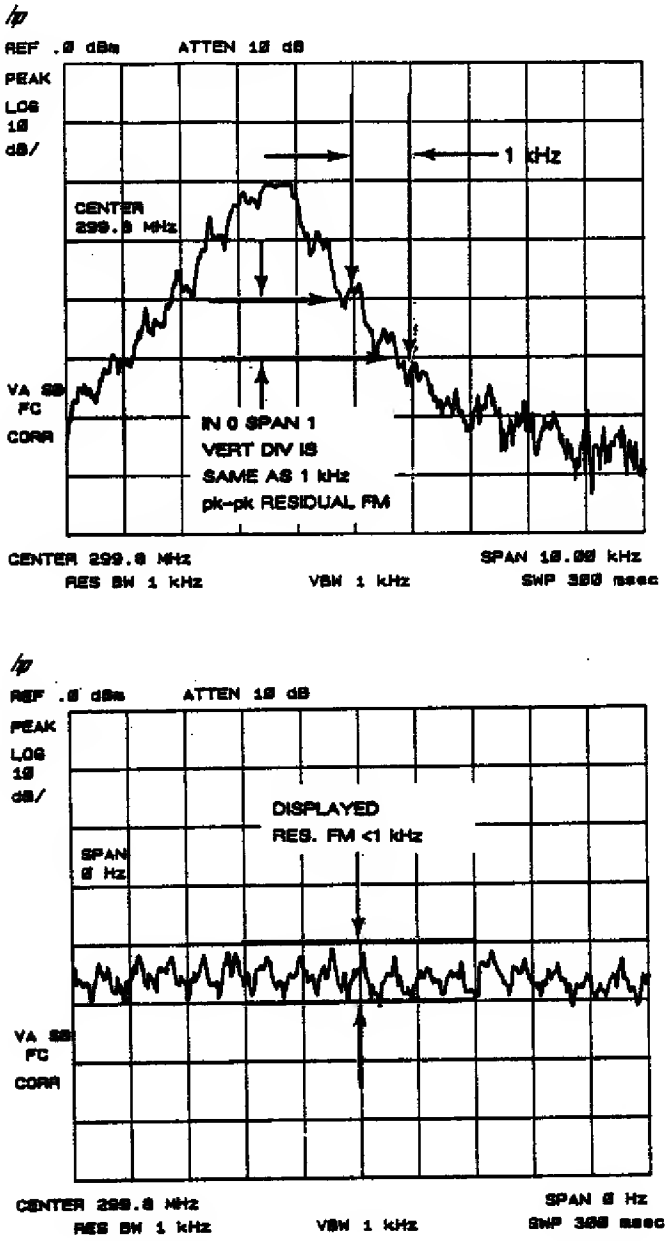
   a. Tune the LO feedthrough to Center.

   b. Use the MRK-SIGNAL track.

   c. Narrow the span to 10 kHz and the resolution bandwidth to 1 kHz.

   d. Use the slope detection now to check residual FM.

   Residual FM is not specified, but is generally $\leq$ 1 kHz. See Figure 4-2 for the CRT display before going to zero span and at zero span. If excessive noise is present, suspect the -10V voltage reference A7U29 and A7Q2, or a defective YIG oscillator A6. Also refer to troubleshooting notes under the TAB A3, A4, A5, A6.



a. For slope detection

b. Slope detected residual FM at zero span from display a above

Figure 4–2. Displays of Residual FM

A display like that shown in Figure 4–2b means that the YIG oscillator is probably good and the –10V reference on the Analog Interface A7 probably is also good (i.e., <2.5 mV on –10V reference).

Troubleshooting a Dead Analyzer

This problem generally is limited to one of the following causes:

- Voltage selector switch on rear panel set incorrectly for your ac mains.
- Blown ac power fuse.
- Front panel LINE switch bad.
- An internal short in the ac power wiring or dc power supply output.
- Shorted high-voltage dc supply inside the Display Module A2

With ac power disconnected, perform the following checks to isolate the fault:

1. Note the setting of the voltage selector switch on the rear panel. The voltage setting must agree with your ac mains voltage (see the accompanying Installation Manual).

2. Check the ac power fuse using an ohmmeter. If the fuse is blown, use the ohmmeter to check the continuity of the ac wiring at the rear panel ac power connector.

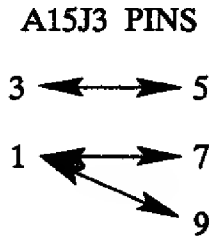
   If you find a short in the ac wiring, remove the cover and repair before proceeding. Visually inspect the analyzer for burn marks, melted insulation, and other indications of shorted wiring, and repair as required.

   If the continuity check is okay, suspect a fuse failure due to fatigue. Replace the fuse and reapply power. If the fuse blows again, suspect a shorted dc power supply output.

WARNING

If the fuse must be replaced, always ensure that the proper fuse type and rating is used. Failure to do so can cause substantial damage to the unit, and serious fire danger.

3. Remove the cover and check the front panel LINE switch using an ohmmeter. When set to the one position, the switch connects the following test points on the IF Motherboard A15 connector J3:



4. Check the dc power supply outputs for continuity using an ohmmeter at the test points given in Table 4-4. Visually check for burn marks, melted insulation, and other indications of problems, and repair as necessary. (The power supply outputs can also be checked with ac power connected by checking to see if the test LEDs on the motherboard are lit.)

   If no shorts exist at the dc supply test points, suspect a fault on the IF Motherboard A15.

Table 4-4. DC Power Supply Continuity Test Points on IF Motherboard A15

Test Point	Pin on J4	Line Description
	2 and 3	Digital Ground
TP1 and ATP2	4 and 5	+5 Vdc
TP3	6	+12 Vdc
TP4	7	Analog Ground
TP5	9	+15 Vdc
TP6	10	-15 Vdc

Calibration Data Problems

Certain analyzer problems are caused if the analyzer user inadvertently deletes the calibration constants. They include correction factors for frequency response flatness and the attenuator 20 dB pad. These constants are stored in EEPROM and are not changed in normal operation. Check the Symptoms section below to see if this could be the problem with your analyzer.

For analyzers with serial numbers below 2618A00588, a user inadvertently can delete or alter these constants by pressing either softkey [SET 20 dB ERR] or [ENTER FLT ERR]. For analyzers with serial numbers 2628A00588 and above, these keys have a lockout combination that must be entered before the calibration constants are altered. All customer analyzers with firmware dated earlier than 11.12.86 should have the firmware replaced by ordering Firmware Update kit HP Part Number 08590-60074. This kit, a set of four ROMs, should be ordered from CPC as "Warranty Always." The firmware date can be viewed on the CRT when first powering up the analyzer or by turning the analyzer OFF and then ON. The analyzer will not require recalibration after replacing the set of four ROMs.

Symptoms

NOTE

Make sure that your instrument has the appropriate firmware revision. Neglecting to do so may result in instrument failure. See Firmware History, Table 4-5, page 4-24.

The failure symptoms described below are caused by loss of or overwriting of the EEPROM correction constants.

- The display has only a flat line at the top of the display rather than a normal trace when signals are present.
- Spurious signals or random noise spikes appear (they may be only a few dB up to 30 dB in amplitude), occurring singly or in multiples.
- The error message `LIN DET FAIL` may appear on the active region of the CRT.
- Other numerical messages may appear, such as:

```
SRQ 110
1330 0000000000
5300 0000000000
```

If you have one of these symptoms, a quick test to verify that the calibration constants have been altered is to turn off the correction feature:

1. Connect CAL OUTPUT to RF INPUT.

2. Press [CAL] [CORRECT/on OFF].

3. The mnemonic CORR should disappear at the lower left side of the CRT, and you should see a normal trace with the CAL signal harmonics present. If you don't see a normal trace, the problem probably is gain-related. Check the first, second and third LO power levels. Substitute an external signal which has a power level verified on a power meter, then confirm that the analyzer gives the correct level. If the level on the analyzer is wrong and all three LOs are at the correct power levels, the first mixer diodes probably have been degraded. Replace the first mixer diodes. Check the CAL DATA display to see if the DAC settings are in the correct ranges (RL-VENR column from near 230-240 at the top to near 3-20 at the low end).

Checking the Calibration Data

Currently stored calibration data for the analyzer can be displayed using the CAL data display function. To access the data, press the following keys:

CAL [MORE]

[DISPLAY CAL DATA]

Figure 4-3 shows a sample CAL data display with CAL output connected to RF Input.

Typical display after running [CAL FREQ], [CAL AMPTD], and [CAL YTO DELAY] and then pressing [DISPLAY CAL DATA]

MISC-FREQ	RL-VENR	ERR	BW-AMP	LC-XTAL	SGAIN	RFATN
299900000	213	0.03	0	0 255	-0.18	-0.17
177380704	205	-0.03	0	0 255	0	0
75069464	198	-0.01	0	0 255	0.17	0.02
3769176	191	0.10	0	0 255	0.37	0.02
0.021705884	181	0.07	0	0 255	0.23	-0.17
0.002170588	172	0.02	0	0 255	0.48	-0.20
0.000217058	165	-0.04	-0.05	0 219	0.36	-0.25
0.000021441	156	-0.02	-0.04	0 159	0.18	0
0.000002144	145	-0.05	-0.01	0 98	-0.01	
0.126070848	134	0.02	-0.01	0 12	-0.11	
0.125000000	123	0.02	-0.56	1 255	1.838848114	
0.125000000	108	0.02	-0.30	95 255	1.863321781	
-4	96	-0.05	-0.23	162 255	1.939518451	
250	75	-0.04	-0.22	217 255	1.591083737	
550	50	-0.05	0	255 255	1.696969125	
71	3	-0.05	0	255 255	1.9999999046	

DISPLAY CAL DATA
CAL YTO DELAY
CONF TEST
VERT POSITION
HORIZ POSITION
CAL FLATNESS

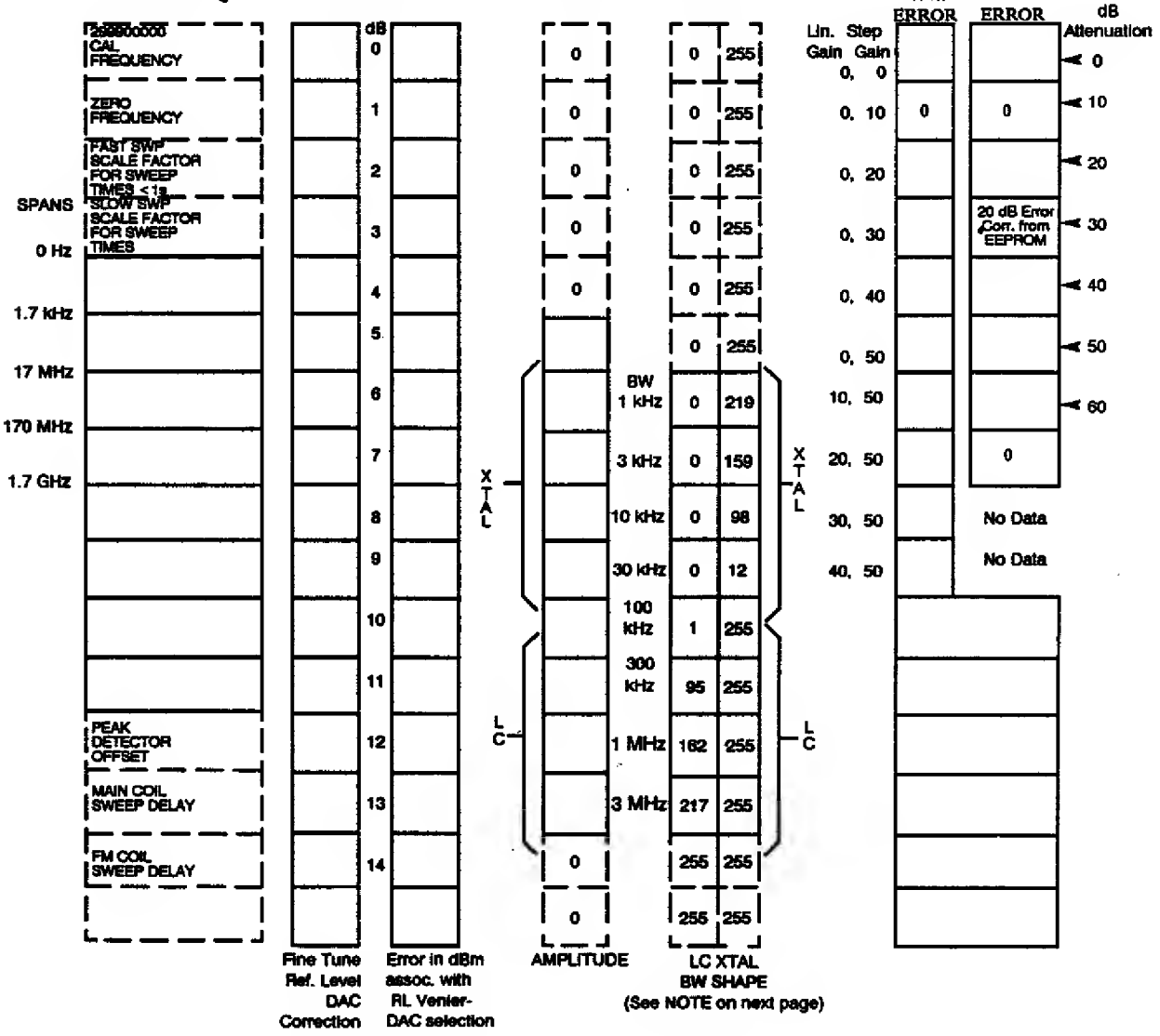


Figure 4-3. Explanation of Calibration Data Display

Checking the Calibration Data

Currently stored calibration data for the analyzer can be displayed using the CAL data display function. To access the data, press the following keys:

CAL [MORE]

[DISPLAY CAL DATA]

Figure 4-3 shows a sample CAL data display with CAL output connected to RF Input.

Typical display after running [CAL FREQ], [CAL AMPTD], and [CAL YTO DELAY] and then pressing [DISPLAY CAL DATA]

MISC-FREQ	RL-VENR	ERR	BW-AMP	LC-XTAL	SGAIN	RFATN	DISPLAY CAL DATA
299900000	213	0.03	0	0	-0.18	-0.17	
177380704	205	-0.03	0	0	0	0	CAL YTO DELAY
75069464	198	-0.01	0	0	0.17	0.02	
37691176	191	0.10	0	0	0.37	0.02	
0.021705884	181	0.07	0	0	0.23	-0.17	CONF TEST
0.002170588	172	0.02	0	0	0.48	-0.20	
0.000217058	165	-0.04	-0.05	0	0.36	-0.25	
0.000021441	156	-0.02	-0.04	0	0.18	0	VERT POSITION
0.000002144	145	-0.05	-0.01	0	-0.01		
0.126070648	134	0.02	-0.01	0	-0.11		
0.125000000	123	0.02	-0.56	1	1.838848114		HORIZ POSITION
0.125000000	108	0.02	-0.30	95	1.863321781		
-4	96	-0.05	-0.23	162	1.939518451		
250	75	-0.04	-0.22	217	1.591063737		
550	50	-0.05	0	255	1.698969125		CAL FLATNESS
71	3	-0.05	0	255	1.999999046		

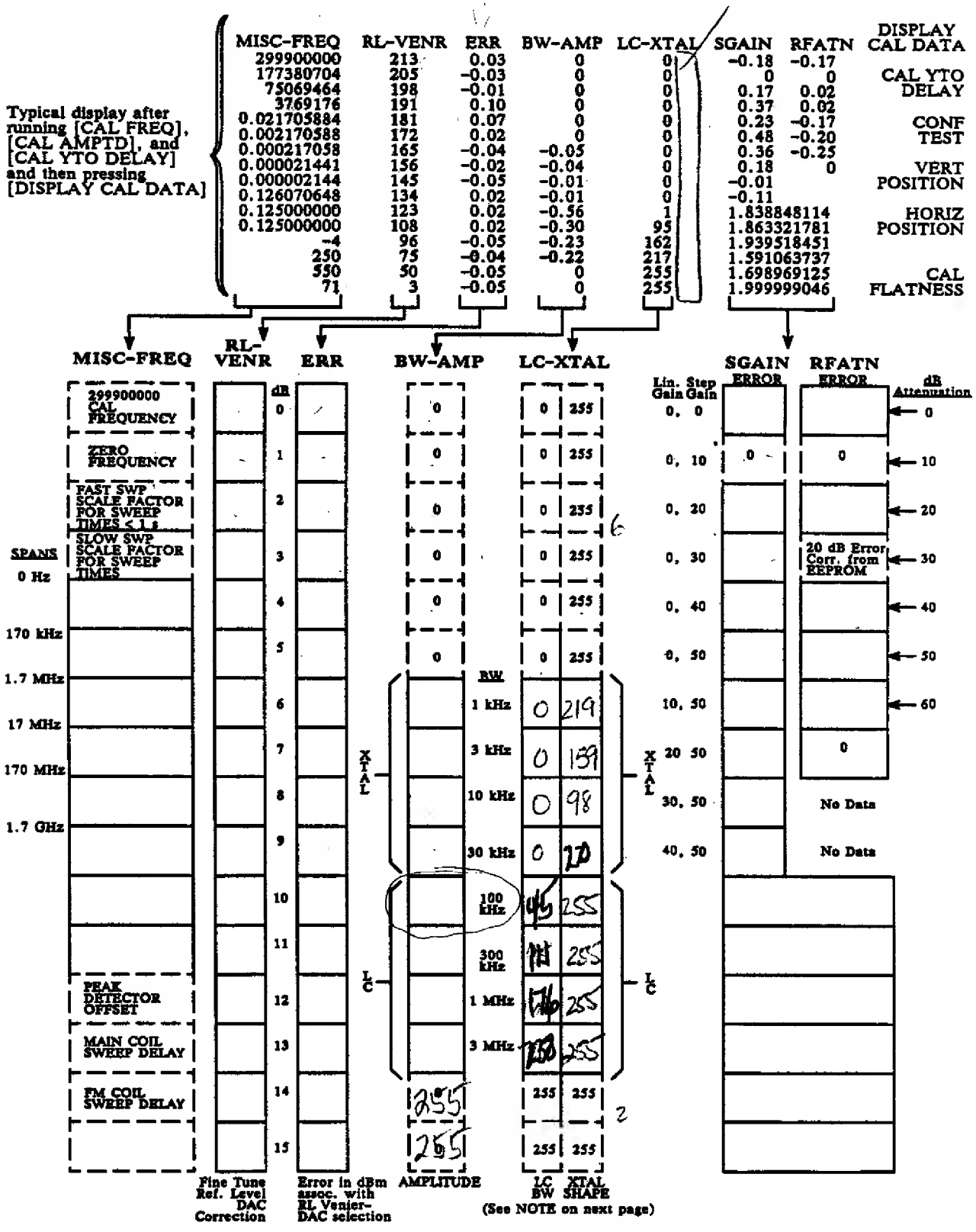


Figure 4–3. Explanation of Calibration Data Display

The processor uses the "boxed" values as calibration correction factors. The "dotted" values are calibration constants (i.e., they are the same value in every analyzer).

NOTE for LC–XTAL DAC's:

LC COLUMN:

BW's 1 Hz to 30 kHz – 0
BW's 100 kHz to 3 MHz – some setting between 0 and 255
(100 kHz - 0, 300 kHz - 100, 1 MHz - 160, 3 MHz - 220)
BW's 10 and 30 MHz – 255

XTAL COLUMN:

BW's 1 Hz to 300 Hz – 255
BW's 1 kHz - 220, 3 kHz - 160, 10 kHz - 100, 300 kHz - 10
BW's 100 kHz to 50 MHz – 255

The accuracy of the HP 8590A is achieved and maintained through mechanical adjustments and correction constants. The two types of correction constants stored in EEPROM are flatness correction and 20 dB attenuator step error. The 20 dB step error data is used in the HP 8590A internal calibration routines.

If the A3 Attenuator Assembly, or A4 First Mixer Assembly is replaced, new correction constants must be generated. Presently, the HP 8590A must be returned to a Hewlett-Packard Repair Center to have new data generated.

If the correction constants are destroyed or the A16 Processor Board Assembly is replaced, factory-generated data can be re-entered using the procedure given below. This procedure involves two main tasks: setting the attenuator error, and entering flatness correction data. Contact the nearest Hewlett-Packard Repair Center to obtain the factory-generated correction constants.

To set the 20 dB attenuator error:

1. Turn on the HP 8590A.
2. Press the following keys:
   FREQUENCY (−) 2 0 0 1 Hz
   CAL [MORE] [CAL FLATNESS] [SET 20 dB ERROR]
3. The analyzer will prompt you: "ENTER 20 dB ATTEN ERROR." Enter the error and terminate the entry with the appropriate dB key.
   The processor will preset the analyzer.
4. Press CAL [CAL FETCH] or cycle the power off then on.

NOTE

To confirm that the correct data was entered, press: [MORE] DISPLAY CAL DATA]. The 20 dB step error is located in the right column RF ATN, (fourth number from the top). See Figure 4-3 of the HP 8590A Support Manual.

To enter the flatness calibration data:

1. Turn on the HP 8590A.
2. PRESET
3. Press FREQUENCY (−) 2 0 0 1 Hz
4. Press CAL, [MORE], and [CAL FLATNESS]
5. ENT FLAT DATA or EEPROM INIT
6. Enter the start, stop, and CF step size. Press:
   ~~FREQUENCY~~ 0 MHz
   1 7 5 0 MHz
   5 0 MHz

5. Enter the flatness calibration data in sequence from 0 MHz to 1750 MHz. The entry of each set of data must be terminated by pressing [MHz] before more data is entered.

NOTE

You may observe which center frequency you are entering by looking in the lower left corner of the CRT.

6. Continue until all data have been entered. After the last entry is terminated, the processor will preset the analyzer.

7. Press [CAL] [CAL FETCH] or cycle the power off, then on. The HP 8590A is ready for operation.

To determine which firmware date code you have, cycle power OFF then ON and look in the active function block on the analyzer's screen for firmware revision information.

Table 4-5. Firmware History

Revision	Revision Date (ddmmyy)	ROM Part Number U6, U7, U23, U24	Serial Break	Major Changes
Original		08590-80003 08590-80004 08590-80005 08590-80006	2618A00001 through 2618A00587	CAUTION *Update all instruments that have the original firmware. Failure to do so may result in loss of calibrated flatness data.
Revision B	11.12.86	08590-80020 08590-80021 08590-80022 08950-80023	prior SN 2618A00587 first SN 2618A00588	*Sets up lock on flatness data entry (first must enter -2001 Hz).
Revision C	9.1.87	08590-80028 08590-80029 08590-80030 08590-80031	prior SN 2618A00796 first SN 2618A00797	
Revision D	31.7.87	08590-80042 08590-80043 08590-80044 08590-80045	prior SN 2742A02206 first SN 2749A02207	
Revision E	29.7.88	08590-80113 08590-80114 08590-80115 08990-80116	prior SN ~~2753A02717~~ → 2816A03137 first SN ~~2816A02718~~ → 2833A03138	
Revision F	14.10.88	~~08590-80127~~ 08590-80128 08590-80129 08590-80130	S/N not known at this time	Allows calibration with LO feedthrough amplitude less than calibration output

08590-60074 Always latest ROM Revision
PGS 5-12-89

5. Enter the flatness calibration data in sequence from 0 MHz to 1750 MHz. The entry of each set of data must be terminated by pressing [MHz] before more data is entered.

NOTE

You may observe which center frequency you are entering by looking in the lower left corner of the CRT.

6. Continue until all data have been entered. After the last entry is terminated, the processor will preset the analyzer.

7. Press [CAL] [CAL FETCH] or cycle the power off, then on. The HP 8590A is ready for operation.

To determine which firmware date code you have, cycle power OFF then ON and look in the active function block on the analyzer's screen for firmware revision information.

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Revision B	11.12.86	08590-80020 08590-80021 08590-80022 08950-80023	prior SN 2618A00587 first SN 2618A00588	*Sets up lock on flatness data entry (first must enter -2001 Hz).
Revision C	9.1.87	08590-80028 08590-80029 08590-80030 08590-80031	prior SN 2618A00796 first SN 2618A00797	
Revision D	31.7.87	08590-80042 08590-80043 08590-80044 08590-80045	prior SN 2742A02206 first SN 2749A02207	
Revision E	1.3.88	08590-80068 08590-80069 08590-80070 08590-80071	prior SN 2753A02717 first SN 2816A02718	

*NOT

NOTE: 08590-60074 FIRMWARE UPDATE KIT WILL ALWAYS HAVE LATEST REVISION.

NEXT Page

CHAPTER 5

ASSEMBLY DESCRIPTIONS

Introduction

This chapter contains detailed descriptions of each major assembly in the analyzer. It is intended to assist you in troubleshooting the suspect assembly that you located using the techniques presented in Chapter 4.

The first section presents an overview of the analyzer operation with an accompanying simplified block diagram. This section also includes a table with recommended troubleshooting times for each assembly. You can use these recommendations to decide whether to fix an assembly or buy a replacement.

Each major assembly or group of related assemblies is marked with a tab. The order of subject matter within each section is:

- Overview of the assembly
- Detailed description
  Troubleshooting hints
  Assembly block diagram
- Component location diagram
- Schematic diagram

Overview

A simplified block diagram of the analyzer is shown in Figure 5–1. Each block corresponds to a physical assembly indicated by an "A" number (e.g. A4, First Converter Assembly). The second part of this chapter is organized by physical assemblies.

The analyzer is a microprocessor–controlled swept receiver covering a frequency range of 10 kHz to 1.5 GHz. It uses a CRT monitor to display signal characteristics. An optional I/O port can be used for external control, and data collection.

Processor A/D

The microprocessor controls internal operation of the analyzer. It receives requests from either the front panel keyboard or an external computer when an I/O port is used. The functions performed by the microprocessor are determined by internal firmware instructions stored in ROM. When an I/O port is used, an external computer can poll analyzer status, download measurement instructions, and collect measurement data from the microprocessor.

I/O Port

Three different types of I/O port are available: two serial ports and one parallel port. The HP–IB parallel port, Option 021, is a standard IEEE–488 bus suitable for connection to any HP–IB or GPIB–compatible calculator or computer. This type of port is used for high–performance test systems. The HP–IL port, Option 022, is a lower–cost serial port used as an alternative to HP–IB. It is based on a loop or ring architecture. The HP–IL port is used with low–cost Hewlett–Packard calculators or with computers having an HP–IL interface. Option 023 is a standard RS–232C serial port. This can be used with any compatible computer system.

Analog Interface

The analog interface generates analog control signals for the analyzer's RF and IF sections. The signals are developed from digital data passed by the microprocessor.

RF Section

The analyzer front–end, or RF section, receives input signals via a 50–ohm input, or via a 75–ohm input for Option 001. Input power must be less than +30 dBm (or +77 dBmV for Option 001) to protect the input mixer and attenuator. The RF signals are passed through a 0– to 60–dB step attenuator that provides input attentuation in 10–dB steps, as selected.

The analyzer uses triple conversion to convert incoming RF signals to a 21.4–MHz IF frequency. Two of these stages are in the RF section. The third stage is in the IF section, described later.

The first stage converts incoming signals to an IF midpoint of 2.05 GHz by mixing a 2.05– to 3.55–GHz tuning signal from the first local oscillator (LO). The frequency of the YIG oscillator is selected by the controller via the digital–to–analog interface. The resulting 2.05–Ghz first IF signal is then downconverted by the second converter stage to an IF midpoint of 321.3 MHz, using a fixed 1728.7–MHz oscillator.

IF Section

The 321.3–MHz IF signals from the second stage are downconverted by the third stage to the final IF frequency of 21.4 MHz, using the 299.9–MHz third local oscillator signal.

The desired IF passband, or resolution bandwidth, is established by four Gaussian–shaped bandpass filters. Eight possible IF bandwidths in the range of 1 kHz to 3MHz can be selected. The bandpass filters can be coupled to the frequency span of the first LO for an optimum ratio of span–to–resolution bandwidth. The step–gain amplifier provides a maximum of 50 dB of amplification for the IF signals in linear steps. The log amplifier provides 70 dB of logarithmic amplification in log mode. In the linear mode it provides an additional 40 dB of gain selectable in 10–dB steps.

Video Control

The video signal is converted to digital format to derive measurement data, which is passed to the microprocessor. The resulting video signal is then passed to the Video Assembly for conversion to the CRT raster display.

Recommended Assembly Troubleshooting Times

Table 5-1 lists some guidelines on cost-effective troubleshooting times for the various component-repairable analyzer assemblies. If the indicated time to isolate to a faulty component or components is exceeded, it may be more cost effective to order a replacement assembly rather than continue component-level fault isolation. However, since part costs can vary widely depending on your geographic location, you may want to adjust the indicated times for your own conditions.

Table 5-1. Cost-Effective Component-level Troubleshooting Times

Assembly	Designator	Repair Time
Analog Interface	A7	2 to 3 hours
Third Converter	A9	1 hour
Second IF	A10	1 hour
Bandwidth Filter	A11, A13	2 to 3 hours
Step Gain	A12	1 hour
Log Amplifier	A14	1 hour
IF Motherboard	A15	1 hour
Processor Assembly	A16	2 to 3 hours
Video	A17	1 hour
HP-IB I/O Board	A18	.5 hour
RS-232C I/O Board	A21	.5 hour
HP-IL I/O Board	A23	.5 hour

Analyzer Internal Assemblies

Table 5-2 lists the internal assemblies of the analyzer, their reference designators (Ref Des), and their major functions. Use the reference designations to locate information in this manual. See Chapter 3 for part numbers used for ordering replacement parts or assemblies.

Table 5–2. Spectrum Analyzer Internal Assemblies

Ref Des	Assembly Name	Major Function(s)
A1	Keyboard	Manual command input
A2	Display Module	CRT display of RF input signals
A3	Attenuator	RF input scaling from 0 to 60 dB in 10–dB steps
A4	First Converter	First IF downconversion
A5	Second Converter	Second IF downconversion
A6	First Local Oscillator (YIG)	Tuning
A7	Analog Interface	Digital–to–analog conversion of data from Processor A/D A16
A8	Power Supply Module	Instrument power supply
A9	Third Converter	Third IF downconversion
A10	Second IF	Second IF bandpass amplifier and filter
A11	First Bandwidth Filter	First selectable bandpass filter assembly
A12	Step Gain	Linear step gain IF amplifier
A13	Second Bandwidth Filter	Second selectable bandpass filter assembly
A14	Log Amplifier	Log and linear gain IF amplifiers
A15	IF Motherboard	Motherboard and power supply filters for IF section
A16	Processor A/D	Microprocessor–based controller and A/D conversion of video signal to digital display data
A17	Video	Conversion of digitized IF spectra to raster video signal
A18	HP–IB I/O	HP–IB (IEEE–488) I/O port, Option 021
A19	HP–IB Connector	Connector assembly for HP–IB Option 021
A20	Line Module	RFI filter for ac power input

continued

Table 5-2. Spectrum Analyzer Internal Assemblies (continued)

Ref Des	Assembly Name	Major Function(s)
A21	RS-232C I/O	Standard serial I/O port, Option 023
A22	RS-232C Connector	Connector assembly for Option 023
A23	HP-IL I/O	HP-IL I/O port, Option 022
A24	HP-IL Connector	Connector assembly for HP-IL Option 022
B1	Fan	Cooling fan for unit
S1	Line Switch	On/Off switch for ac power

Attenuator Assembly A3

The Attenuator Assembly attenuates the RF input signal in 10–dB steps from 0 to 60 dB. Repeatable attenuation and gain in the signal path preserve amplitude calibration and direct reading of signal amplitudes on the CRT. Operator adjustment of the attenuator establishes the optimum signal level applied to First Converter Assembly A4.

First Converter Assembly A4

Within the First Converter Assembly (Figure 5–2 and 5–4) the incoming signal mixes with the local oscillator signal from the First Local Oscillator Assembly generating the 2.05–GHz first IF signal. An input low–pass filter passes RF signals below 1.55 GHz to the mixer. A 2.05– to 3.55–GHz tuning signal from the First Local Oscillator Assembly is routed to the mixer through a power splitter. The power splitter generates a nominal local oscillator output of +12 dBm. The 2.05–GHz IF from the mixer is attenuated by a 6–dB pad and passed through a 5.00–GHz low–pass filter to restrict out–of–band signals. The resulting 2.05–GHz first IF signal is then passed to the Second Converter Assembly, through the 2.06 GHz LPF, A26

Detailed Description

The RF signal input passes through a 1.55–GHz low–pass filter to the Mixer Diode Assembly U1. Seen from the mixer, the output impedance of this low–pass filter is effectively a short circuit at 2.05 GHz, reflecting any IF power back to the mixer.

The first LO (local oscillator) input from the YIG Oscillator Assembly A6 passes through a 3–dB power splitter consisting of two resistors, R1 and R2, and etched transmission lines. One of the power splitter outputs provides the front panel signal 1ST LO OUTPUT; the other output provides drive voltage to the mixer diode through a balun or short piece of semirigid coaxial transmission line. The local oscillator signal is coupled to one mixer diode through the balun shield and to the other mixer diode through the balun center conductor. This splits the local oscillator signal voltage evenly between the two mixer diodes.

The 2.05–GHz output signal from the mixer is split–line coupled to a 6–dB π resistive matching pad composed of R3, R4, and R5. A small block of polyiron is placed over the split–output line. The polyiron helps balance the mixer and absorbs harmonics of the mixing signals. A 5.00–GHz low–pass filter etched on the printed circuit board of the First Converter Assembly provides additional filtering to the 2.05–GHz IF signal. The signal is then coupled to the Second Converter Assembly through a ~~semirigid coaxial cable.~~

2.06 GHz LPF A55, A26.

Troubleshooting Hints

First check the supply voltages. If the supply voltages are OK, use the analyzer setup and power levels shown on the schematic in Figure 5-6.

The most common first converter problem is damage to the mixer diode. The usual symptom is a 10- to 14-dB loss of sensitivity. For example, a signal will measure -34 dBm when its amplitude is known to be -20 dBm.

If there is residual FM, suspect the first local oscillator. Residual FM can be induced in the local oscillator by noise on the -10V reference to the oscillator or a noisy main coil driver or filter. If you suspect a spurious response problem, check for loose or faulty RF connections.

ANY CHANGES IN THE RF PATH WILL REQUIRE A RECALIBRATION)
A defective YIG coil Assy can cause osc in the yig
e.g. random spikes on either side of the LO.
yig is susceptible to microphonics

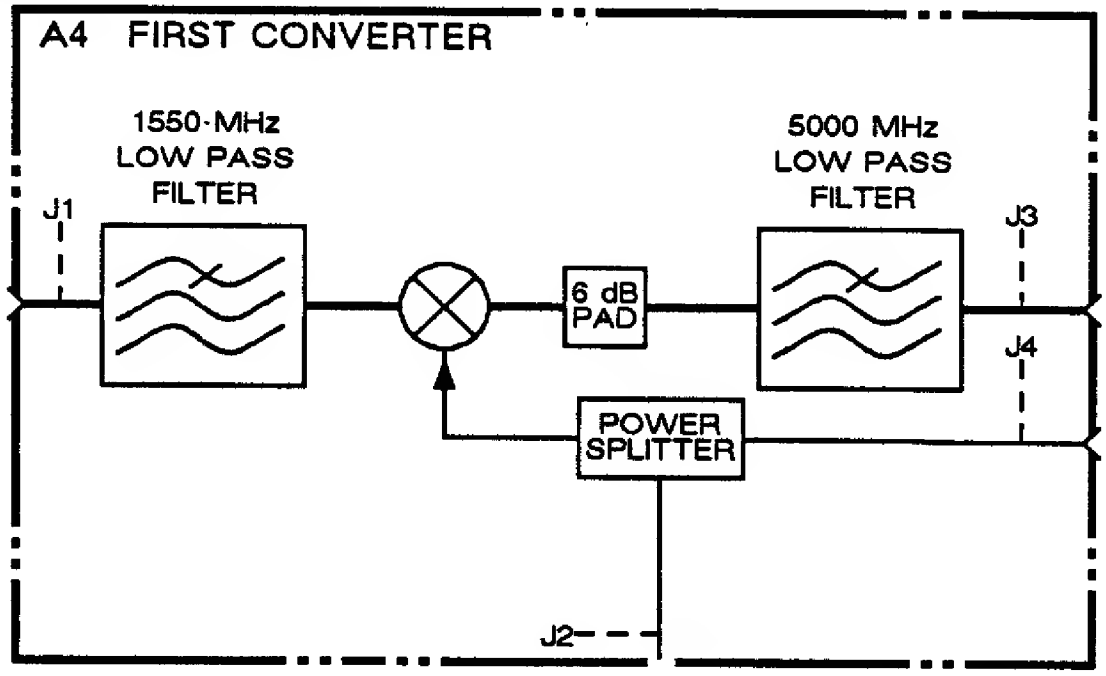


Figure 5-2. First Converter Block Diagram

Second Converter Assembly A5

Within the Second Converter Assembly, the first IF signal mixes with a fixed 1.7287–GHz second local oscillator signal, generating the 321.3–MHz second IF signal. Several functional elements are included in the Second Converter Assembly (see Figures 5–3 and 5–5). The 2.05–GHz bandpass filter uses the resonant characteristics of three precisely machined cavities in the aluminum–block housing to filter the first IF signal. A fourth cavity in the housing is used as a resonant circuit for the 1.7287–GHz second local oscillator signal. The second local oscillator is biased using reference voltages from the Analog Interface Assembly. The resulting 321.3–MHz IF signal from the mixer is routed to the Second IF Assembly through a matching filter.

Detailed Description

The IF signal from the First Converter Assembly is coupled into the Second Converter bandpass filter through coupling loop L3. The bandpass filter consists of three circular, slug–tuned cavity resonators operating as less than a quarter wavelength inductive transmission lines. The cavities provide high "Q" for good selectivity at 2.05 GHz. Coupling loops L4 and L5 provide coupling between the cavities. The 2.05–GHz signal is loop coupled to the cathode end of the second mixer diode CR1. The second local oscillator signal is loop coupled to the anode end of CR1.

The second local oscillator is a Colpitts–type circuit operating at 1.7287 GHz. The capacitive "fingers" etched on the printed circuit board of the Second Connector Assembly and the internal transistor capacitances of A5A1Q1 provide the positive feedback necessary to sustain oscillation. The oscillator tank circuit is a slug–tuned cavity. The signal from the second local oscillator is coupled into cavity Z4 by a 5–40 machine screw extending down into the cavity. The second local oscillator output signal is also available at test jack A5J3.

The 1.7287–MHz local oscillator provides the drive for mixer diode CR1. The frequency difference between the 2.05–GHz first IF signal and the 1.7287–GHz second local oscillator signal is 321.3 MHz. This 321.3–MHz signal is coupled through the matching filter to the Second IF Assembly. The matching filter is a passive network designed to match the relatively high (~200 ohms) impedance of the second mixer to the low (~50 ohms) input impedance of the second IF. The match may be optimized by adjusting A5L2, 2nd MIXER MATCH adjustment.

Troubleshooting Hints

Check the second local oscillator output at the test jack A5J3 for 1728.7 MHz ± 0.5 MHz. If the second local oscillator signal is missing, check the supply voltages at the edge of Second Converter.

a flat baseline without signals, or a start/stop freq. off hundreds of MHz are symptoms of a defective 2nd LO!

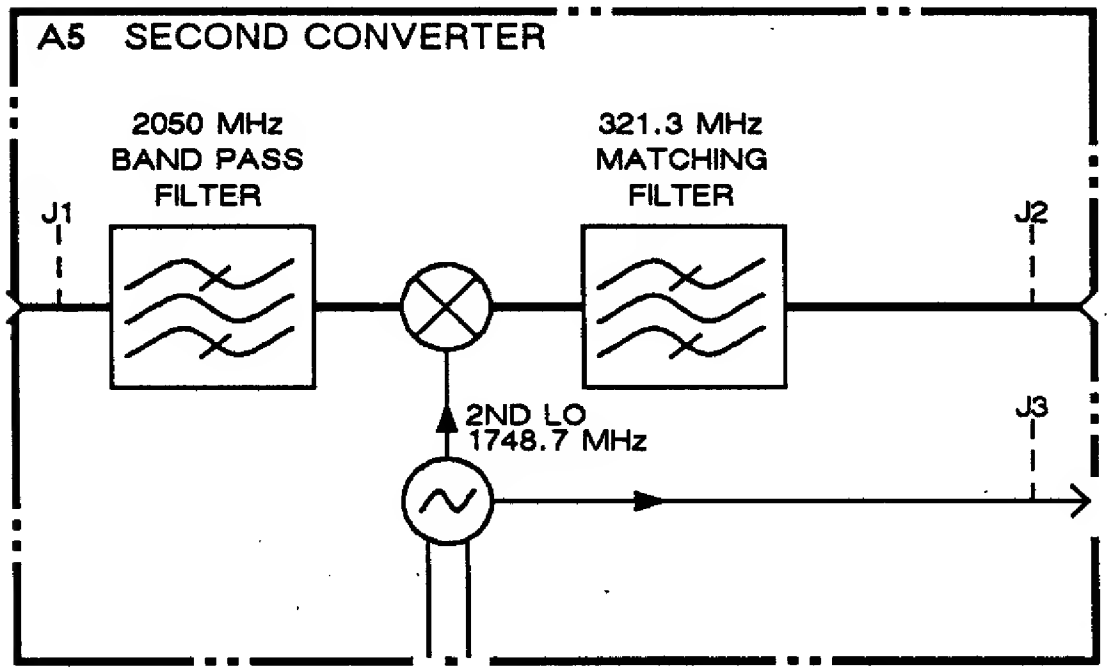


Figure 5–3. Second Converter Block Diagram

First Local Oscillator A6

The First Local Oscillator Assembly is a YIG–tuned oscillator (YTO). YIG (yttrium–iron–garnet), a ferro–magnetic material, is polished into a small sphere and precisely oriented in a magnetic field. Changes in this magnetic field alter the frequency of the signal generated by the YTO. Voltage control of the magnetic field surrounding the YIG sphere allows the analyzer to be swept or tuned within the frequency range of 2.05 to 3.55 GHz used in the First LO. A sweep control voltage generated by the Analog Interface Assembly tunes the YTO in sync with the horizontal deflection of the CRT beam of the display module. A tuning voltage offsets the sweep to set up the YTO center frequency.

Troubleshooting Hints

First check the supply voltage. If the supply voltages are OK, use the analyzer setup and power levels shown on the schematic (Figure 5–6) to isolate the problem.

If you observe excessive residual FM, the YIG Oscillator is the most likely suspect. Before replacing the YIG, however, check the –10V reference from the Analog Interface Assembly. Observed noise level greater than 2.5 mV could be the cause of the residual FM. Also check the main coil driver, main coil filter, and FM coil driver in Analog Interface Assembly. If you suspect a spurious response problem, check for loose or faulty RF connections.

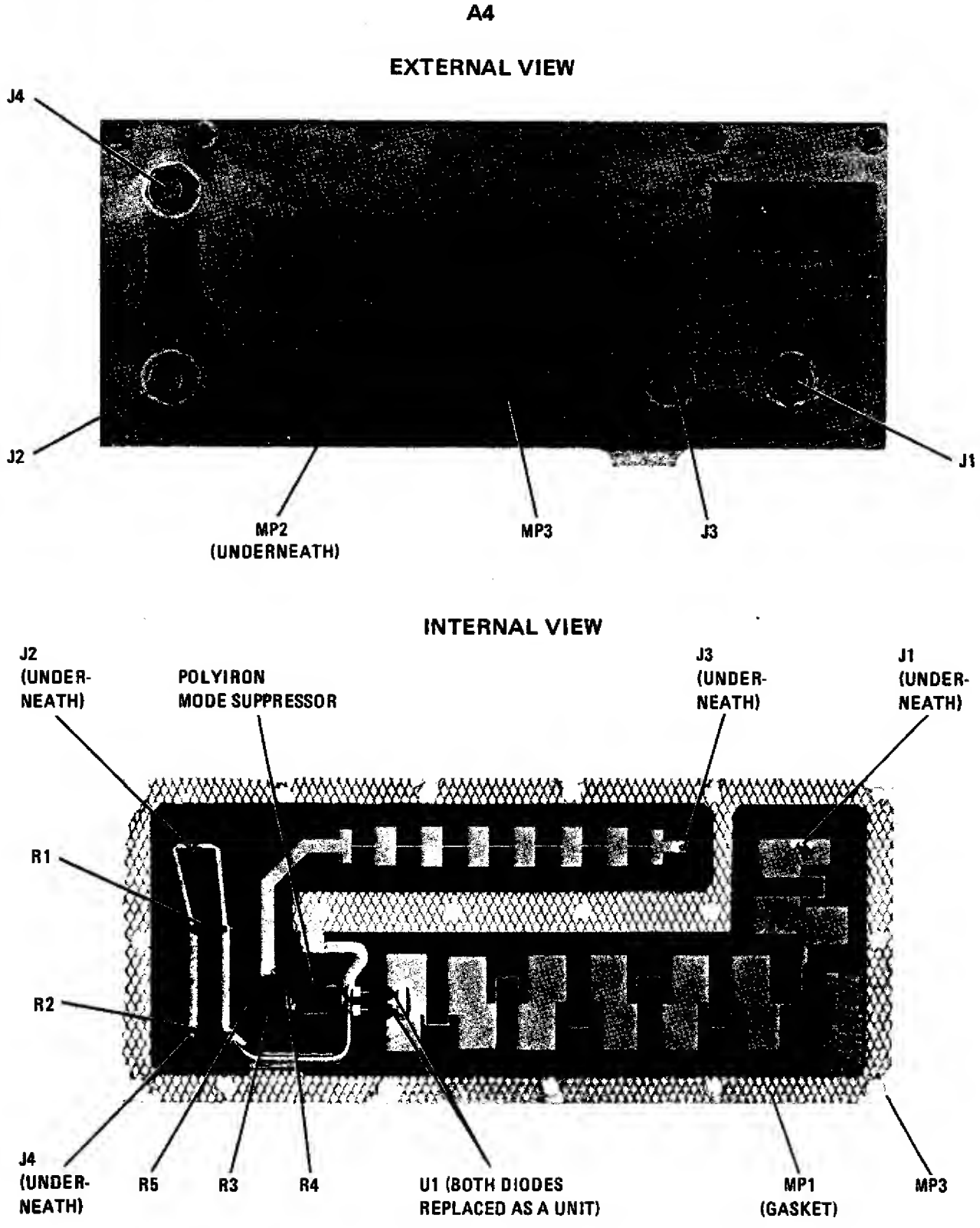


Figure 5–4. First Converter (A4) Component Locations

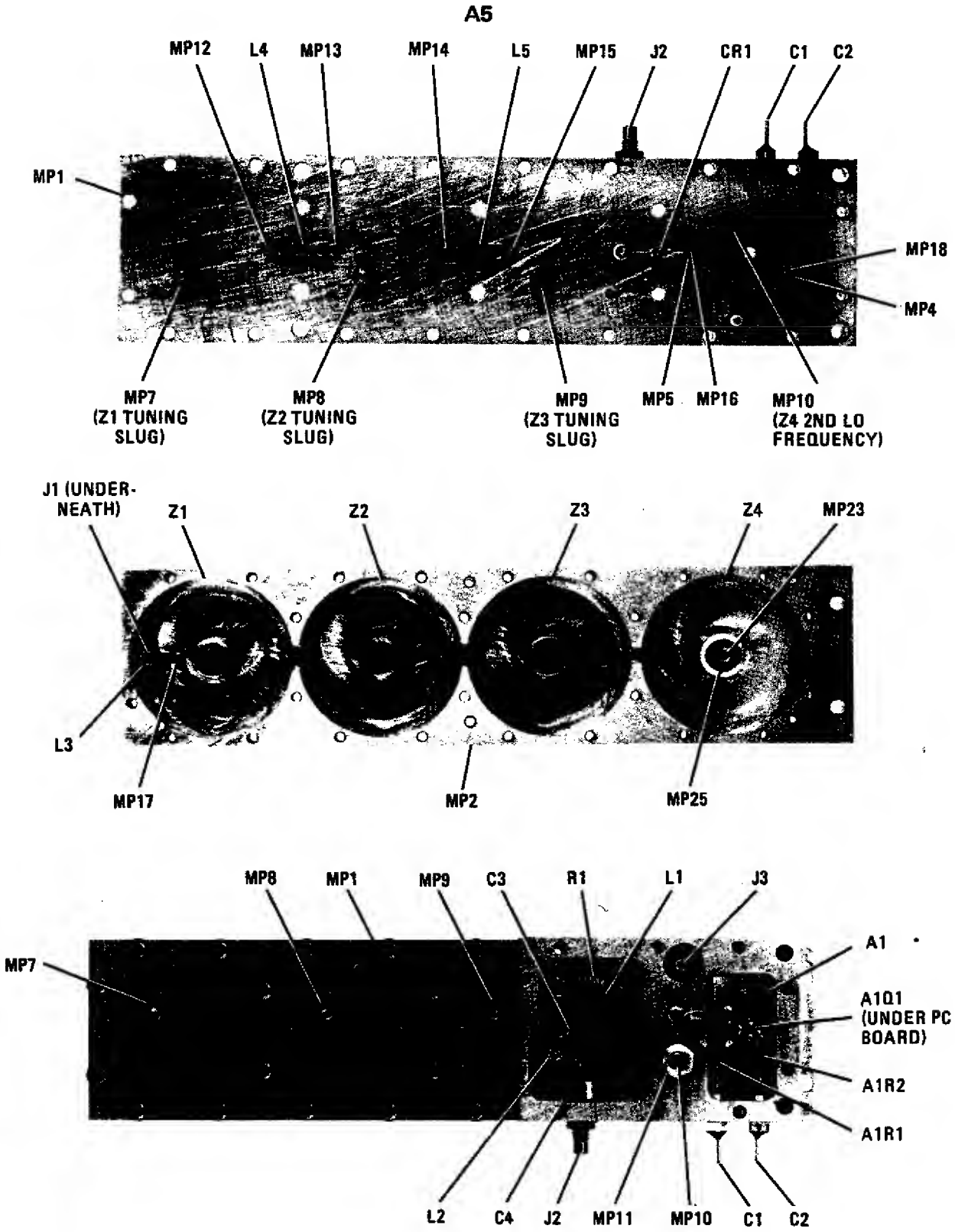


Figure 5–5. Second Converter Component Locations

Analog Interface A7

The Analog Interface Assembly performs digital-to-analog conversion on data received from the Processor A/D Assembly. The resulting analog signals control the assemblies in the RF and IF sections. See Figure 5-8 at the end of this section for a block diagram of the Analog Interface Assembly.

Data is received via the I/O bus (IOB0 through IOB15) from the Processor A/D Assembly. Incoming data is latched into the appropriate device in the analog interface from IOB address lines from the processor. The data is then routed to the associated digital-to-analog converter (DAC) in the analog-interface assembly, where it is converted to an analog current. The analog current is used to control one or more functional elements in the RF or IF section assemblies.

Detailed Description

The Analog Interface Assembly develops control and tuning currents from digital data passed via I/O bus lines IOB0-IOB15 from the Processor A/D Assembly. This assembly contains these main functional elements (refer to Figures 5-9 and 5-10):

- Main coil driver, including coarse tune DAC, fine tune DAC, sweep time DAC, and binary span DAC
- FM coil driver, including extra fine tune DAC, sweep time DAC, binary span DAC
- Sweep ramp generator
- Step gain control
- Log amplifier control
- Bandwidth control
- Third converter REF_CAL
- Attenuator driver

Main Coil Driver

The main coil driver (Figure 5-7) generates the control current for the main tuning coil of the YTO. The main coil driver consists of amplifier U28, Q1, Q7 and associated FET switches U35A-D, U37A-D and the passive biasing components.

Tuning data loaded into the coarse and fine tune DACs are converted to an analog voltage when the processor places the data on IOB0-IOB11 and asserts the write strobe (WC for coarse data; WF for fine data) to the bus receivers. U21 and U25 output drives current and drives the input of the main coil driver. The reference voltage for the DACs is + 10 volts at pin 17

YTO main coil tuning is accomplished by the main span voltage ramp generated by the binary span DAC. The main span current from U23 is applied to the input of the main coil driver, along with the -10 VF reference and the output of the coarse and fine tune DACs.

The main coil driver, U28, Q7, and Q1, has FET switches U35 and U37 that select passive components in the main coil driver to control the coil driver bandwidth. The switch states are determined by the state of the LFLT and HCHG lines (IOB14 and IOB15 from the processor). Figure 5-7 shows the circuit configuration and the selectable main coil driver bandwidths and components used in different spans.

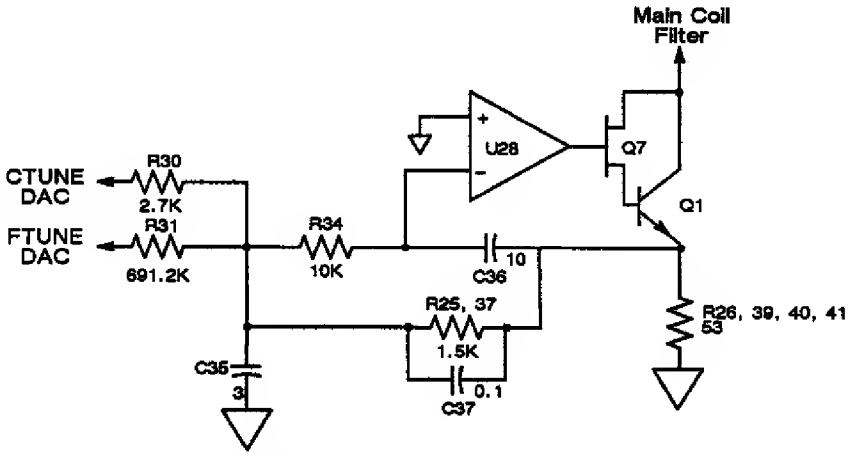
Sweep Generator

The Sweep Generator generates a sweep ramp signal that is eventually used to sweep-tune the First Local Oscillator. The sweep signal is applied to the binary span DAC, where it is scaled to drive the main coil and FM coil drivers. The sweep generator consists of the following active components:

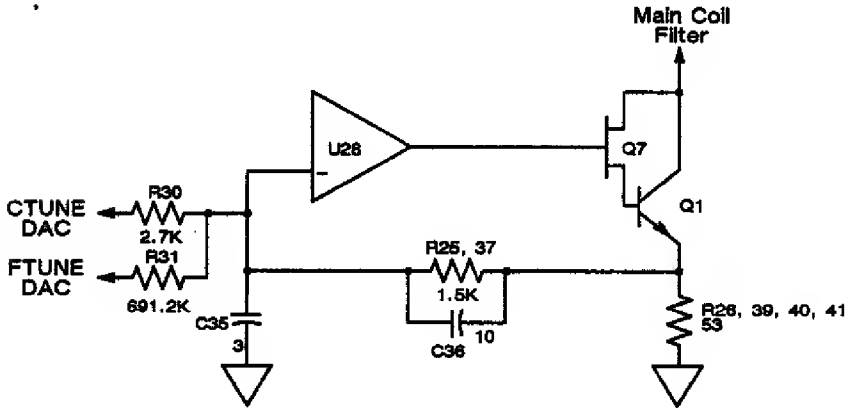
- Bus receivers U6 and U7
- Sweep time DAC U14
- Reference amplifier U19
- Sweep ramp generator U20, U36A, U36D
- Sweep output driver U24

Tuning data is loaded into the I/O bus lines DAC and converted to an analog voltage when the processor places the data on IOB0-IOB11 and asserts the write strobe WST to the bus receivers. Output drive and a reference level for the DAC output is provided by U19.

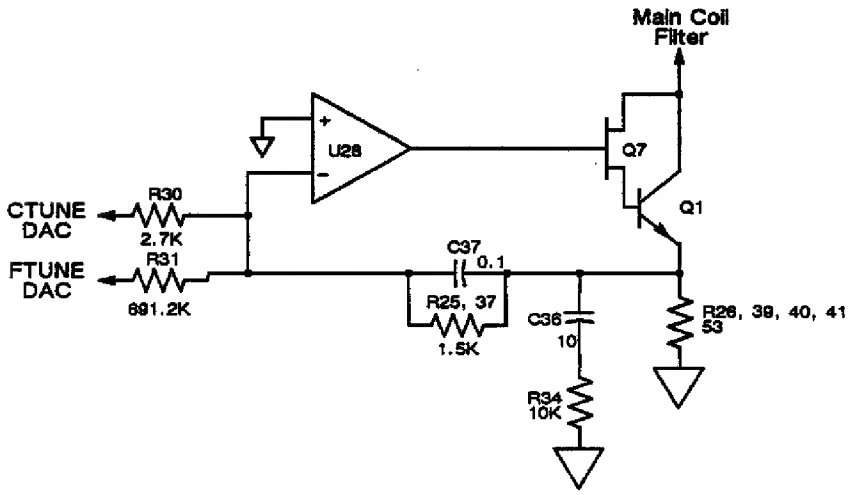
The sweep ramp generator develops the sweep signal from the output of U19. FET switch U36A opens at the start of the sweep cycle to allow C14 to charge. When C14 is fully charged at the end of the sweep cycle, LRST is asserted by the processor via IOB13, and U36A closes. When sweep times longer than one second are selected, the processor asserts HFLS via IOB12 to close FET switch U36D and switch in C13. The sweep ramp output is applied to the reference input of binary span DAC. The output of U20 is also routed to sweep output driver U24 to provide the SWEEP OUT signal at J5 on the analyzer rear panel.



a. Span <2 MHz Bandwidth = 1.5 Hz



b. 2 MHz < Span <17MHz Bandwidth = 10 Hz



c. Span >17 MHz Bandwidth = 1kHz

Figure 5–7. Main Coil Driver Simplified Schematics

Step Gain, Log Gain, and Bandwidth Filter Control

This circuitry generates control voltages and select lines for the step gain amplifier A12, log amplifier A13, and bandwidth filters A11 and A13. It consists of the following active components:

- Bus receivers U101, U103, and U107
- BW6 DAC U102 and BW7 DAC U104
- Transistor packages U109, U110, U111, and U112

Bandwidth data is loaded into the BW6 and BW7 DACs and converted to analog currents when the processor places the data on IOB0-IOB15 and asserts the write strobe LBW to bus receivers U101 and U103. The output of DAC U104 is sent to bandwidth filters A11 and A13. The output of U102 is summed with BW6 drive current output by U109B and then routed to the bandwidth filters A11 and A13.

BW6 and BW5 select data are passed to the line driver circuits when the processor places the data on IOB8-IOB15 and asserts the write strobe LGAIN to U107 bus receiver. The transistor packages U109, U110, U111, and U112 generate the required drive for the control lines (-8VT, Log-Lin, IFG1-IFG6, BW5, and BW6) to the step gain, log gain, and bandwidth filter circuits.

Note that Attenuator A3 is controlled by the RF10, RF20, and RF30 lines, which are received from the processor on IOB12 through IOB14. The lines are buffered by inverters U110E through U110G and output directly to the attenuator.

FM Coil Driver

The FM Coil Driver sums the sweep ramp from the FM span driver and the extra fine tune DAC current for the FM tuning coil (FM+) of the First Local Oscillator (YIG) A6. The major active component is U30.

Tuning data is loaded into the extra fine tune DAC and converted to an analog current when the processor places the data on IOB0-IOB11 and asserts write strobe WXF to the bus receivers. +15VR reference level for the extra fine tune DAC output is provided by U17. This is applied, along with the sweep ramp from the Binary Span DAC, to FM coil driver U30.

Binary Span DAC

The binary span DAC takes the sweep ramp input (VREF) and divides it in decade steps as necessary for the main coil driver and the FM coil driver. It consists of the following active components:

- Bus receivers U4 and U5
- Binary span DAC U13
- Reference amplifier U18
- Multiplexers U31A and U32B
- Main span and FM span drivers U23 and U22

Tuning data is loaded into the DAC and converted to an analog voltage when the processor places the data on IOB0-IOB11 and asserts write strobe WSP to the bus receivers. Output drive is provided by U18. Resistors R5 and R6 divide the voltage by 10 and 100, respectively, for spans from 1.7 GHz, 170 MHz, 17 MHz, 1.7 MHz, and 170 kHz. The decade values are applied to the multiplexers and are selected according to the FMS0 and FMS1 control lines, which are determined by IOB12 and IOB13 from the processor. The span selected determines the appropriate span driver used: main or FM coil driver.

Third Converter LO Reference

The Third Converter RTF CAL circuit (Figure 5-10, sheet 3) generates a reference voltage (REF_CAL) that is used to control gain in Third Converter A9. It consists of the following active components:

- Bus receiver U105
- Reference DAC U106

Calibration reference data is loaded into the DAC and converted to an analog voltage when the processor places the data on IOB0 through IOB7 and asserts write strobe LGAIN to the bus receiver (note that it is loaded along with the gain/bandwidth control byte). The resulting REF_CAL voltage from U106 is passed to the local oscillator in the Third Converter Assembly.

Test Point Mux/Processor Control Buffer

This circuitry provides multiplexed processor access to DACs. These test point outputs can be viewed through softkey diagnostics under the Sweep/BW key menus. It consists of the following active components:

- Multiplexers U31B, U32A, and U33
- Driver U26
- Demultiplexer U1

The DAC, sweep, and control signals are available from the ANA_TEST output of U26 when the ATP0 through ATP2 lines to multiplexer U33 are set. The ANA_TEST signal is passed to the Processor A/D Assembly and is displayed when firmware diagnostics under the [SWP/BW] menu are executed.

Demultiplexer U1 generates the data load strobes for the bus receivers from states on the I/O address and control lines received from the processor.

Troubleshooting Hints

If a problem occurs only when spans greater than 17 MHz are selected, the fault probably lies in the circuitry associated with the main coil driver. If a problem occurs only when spans less than or equal to 17 MHz are selected, the fault probably lies in the circuitry associated with the FM coil driver. If the problem occurs when any span is selected, suspect the binary span DAC, associated bus receivers U4 and U5, or multiplexers U31A and U32B. In this case, also check the sweep circuitry for presence of the indicated ramp waveform.

Note that both the main coil driver and FM coil driver circuitry can be susceptible to excessive noise. If you suspect a frequency stability or residual FM problem, use an oscilloscope to verify the noise level at FET switch U37D pin 15. It should be less than 2.5 mV. If this and other coil driver checks are OK, suspect a problem in the First LO Oscillator.

If you suspect RF attenuator control, the problem is most likely in bus receiver U8, or line drivers in U110. If these are OK but the controls still are incorrect, suspect the Attenuator Assembly. However, if the coarse tune DAC operation is wrong, test with softkey [COARSE TUNE DAC] under the front panel key.

These softkey tests are documented later in this section. If a main coil filter problem is also present, suspect a bus driver/receiver problem on I/O bus lines IOB12 through IOB-14.

If you suspect a tuning problem, note that the coarse, fine, and extra fine DACs function as a 28-bit equivalent DAC, with 3% nominal resoultion. Consider the amount of tuning error present to find the probable fault location.

Diagnostics Routines

The analyzer firmware has built-in diagnostics routines that allow front panel trouble-shooting. The Analog Interface Assembly has several test points multiplexed to the 68000 microprocessor. The firmware routines that allow access to these test points on the Analog Interface board are accessed using the front panel [SWEEP BW] key.

To access the firmware routines, press these keys:

[SWEEP BW]
[DETECTOR]
[ANALYZER TEST]

A menu appears with these choices:

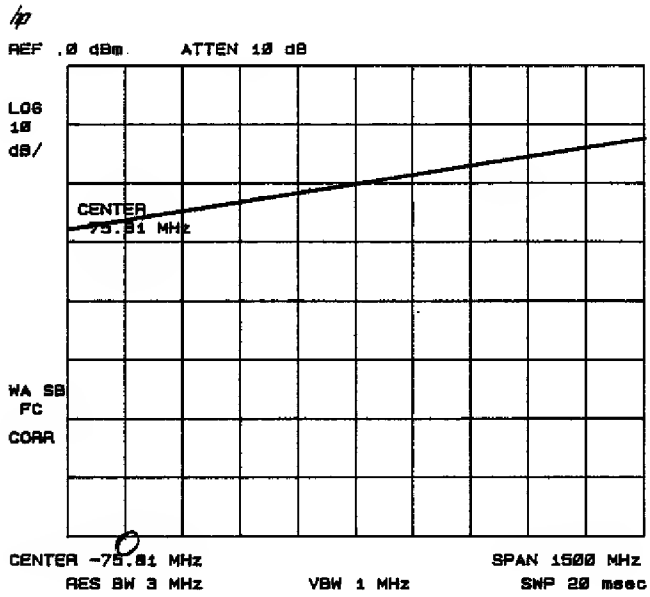
[MAIN COIL DR]
[FM COIL DRIVE]
[FM SPAN]
[BINARY SPAN]
[MORE]

Press [MORE] to access the second set of choices. All of these are test points on the Analog Interface Assembly.

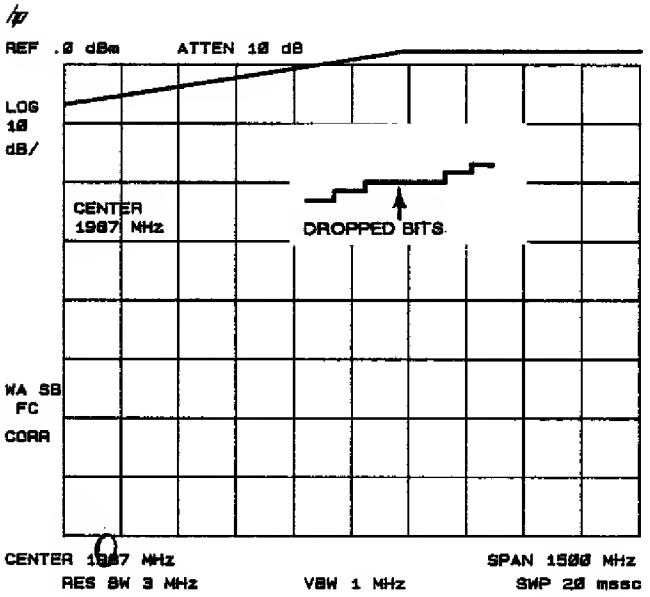
[SWEEP RAMP]
[SWEEP TIME DAC]
[COARSE TUNE DAC]
[FINE TINE DAC]
[X FINE TUNE DAC]

The following pages show typical screen displays for each of these routines.

[MAIN COIL DR] Routine



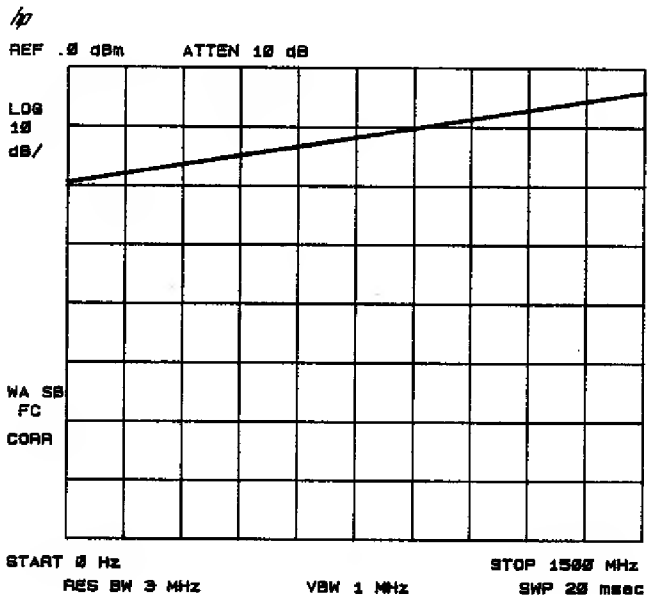
a. Low Frequency. Output of A7Q1 is linear.



b. High Frequency. Output of A7Q1 is in saturation.

Emitter of A7Q1, signal MC_DVR, in main coil driver, block D of Figure 5–10

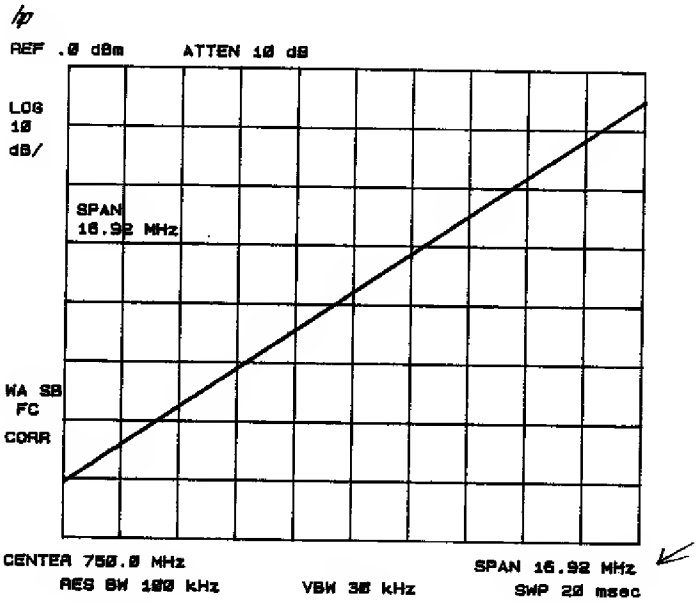
[MAIN COIL DR] Routine (continued)



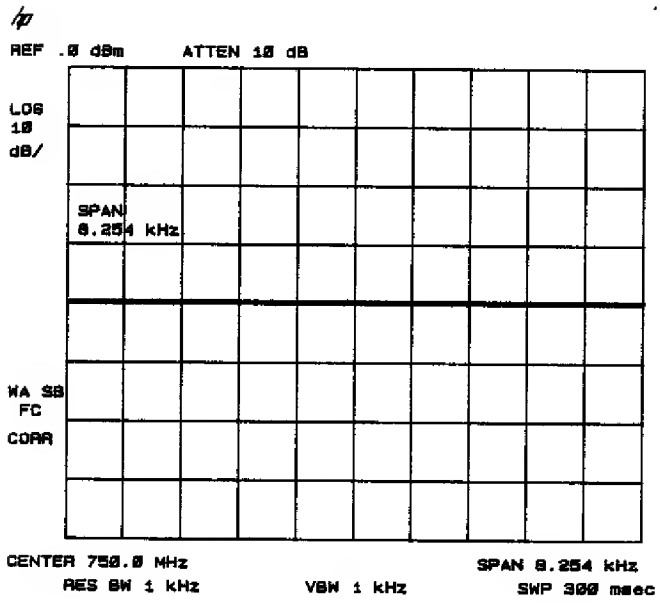
c. *Nominal output of A7Q1 after running [CAL FREQ] & [CAL AMPTD] routines.*

Emitter of A7Q1, signal MC_DVR, in main coil driver, block D of Figure 5–1 (continued)

[FM COIL DRIVE] Routine



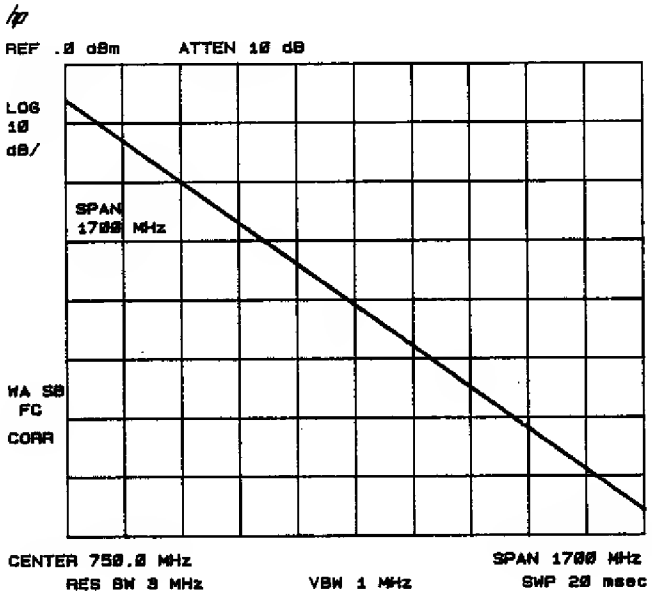
a. At -17 MHz, just before drive switches to main coil drive.



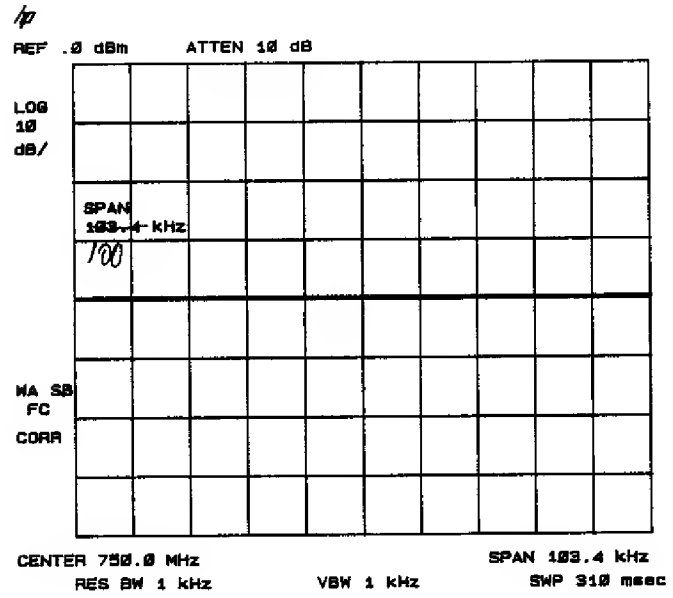
b. For lower frequencies, drive is essentially zero volts with no noticeable change on CRT down to 1-kHz span.

Output of A7U30, signal FM_DVR, in FM coil driver, block J of Figure 5–10

[MAIN SPAN] Routine



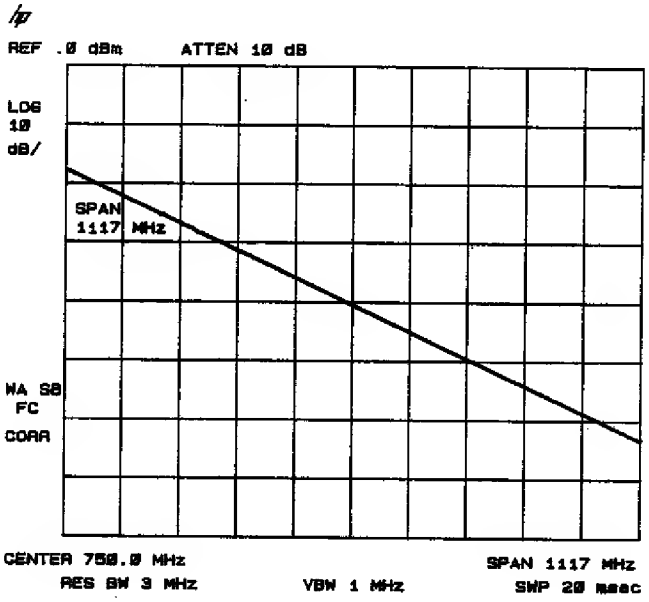
a. *At maximum span, press [MAIN SPAN] and* SPAN *and turn RPG to maximum. Active area of CRT should display "SPAN 1700 MHz."*



b. *At 1.0 kHz*

Output of A7U23, signal MC_SPAN, Block E of Figure 5–10

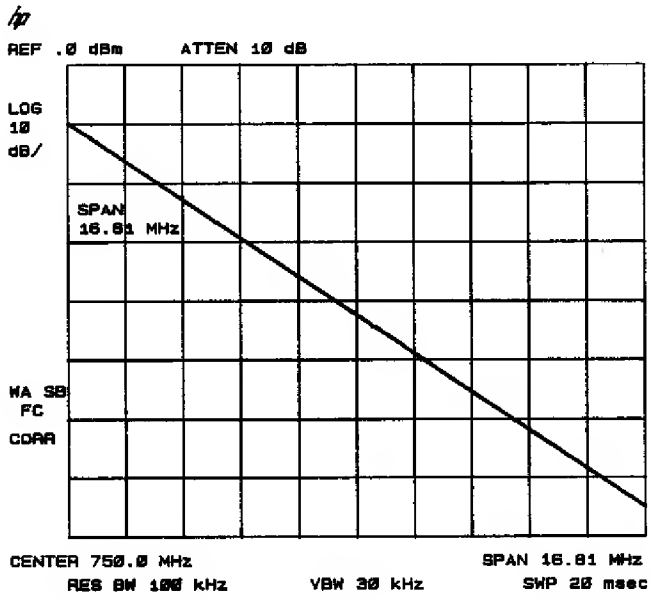
[MAIN SPAN] Routine (continued)



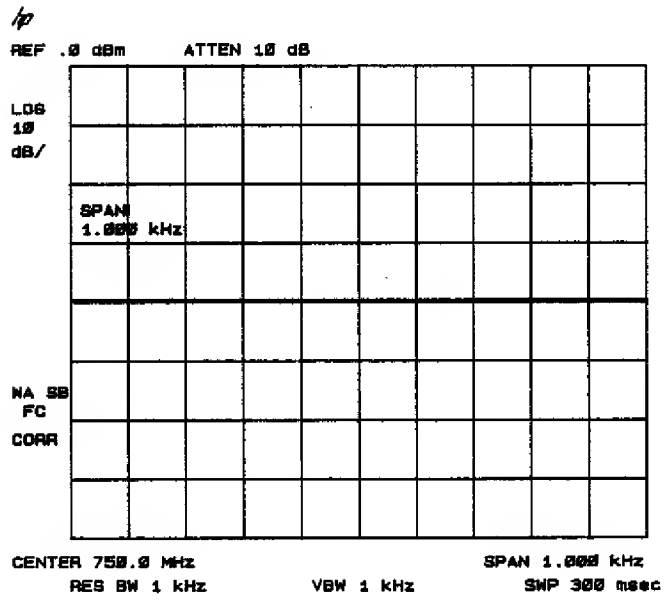
c. *At 1117 MHz.*

Output of A7U23, signal MC_SPAN, block E of Figure 5–10 (continued)

[FM SPAN] Routine



a. At 16.7 MHz, just before switching to main coil span.

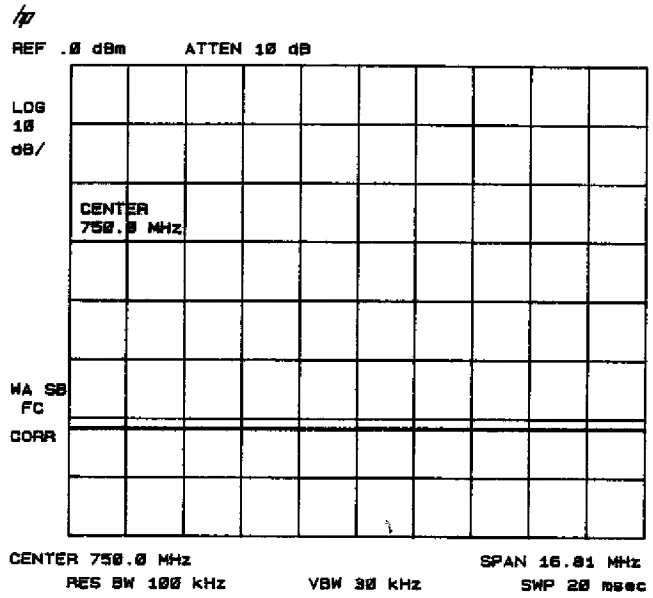


b. At 1 kHz

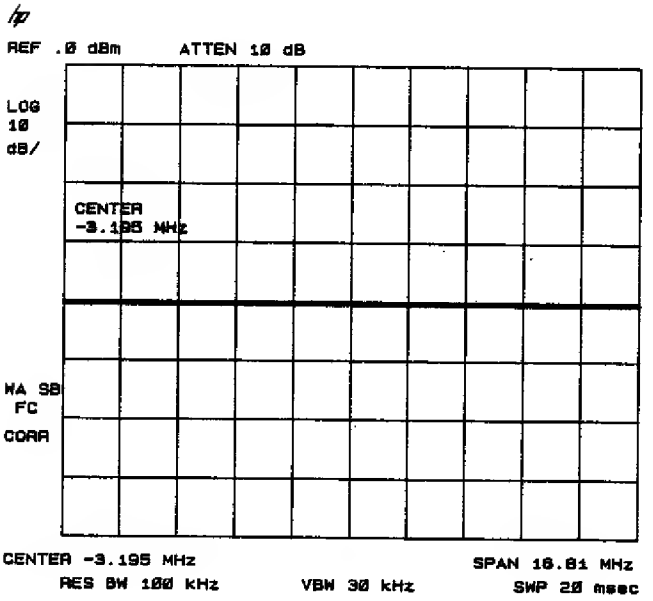
Output of A7U22, signal FM_SPAN, block G of Figure 5–10

From 1 kHz to 17 MHz the output should be continuously variable. At frequencies greater than 17 MHz, the output of A7U22 goes to zero (displayed as flat line at center of CRT) and the drive switches to A7U23, the main span driver.

[X FINE TUNE DAC] Routine



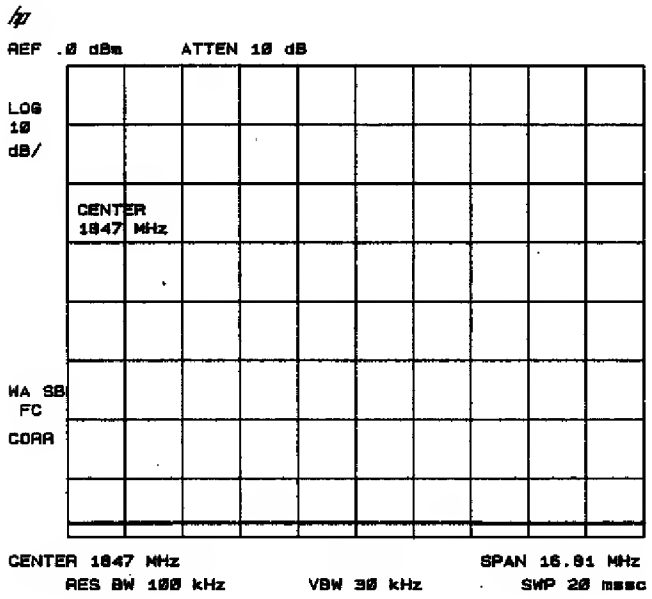
a. *After pressing* [DETECTOR] [ANALYZER TEST] [MORE] *then pressing* [X FINE TUNE DAC] *and* [FREQUENCY]. *Turn the RPG to vary DAC output (A7U17 output).*



b. *At minimum frequency (-0V). RPG turned CCW*

Output of A7U17, SIGNAL XFTUNE, Block F in Figure 5-10

[X FINE TUNE DAC] Routine (continued)

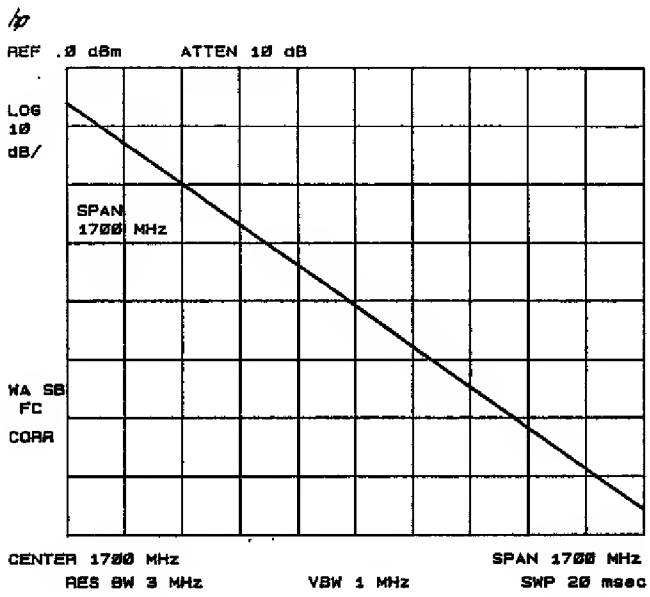


c. *At maximum frequency (-10V)*

RPG CW

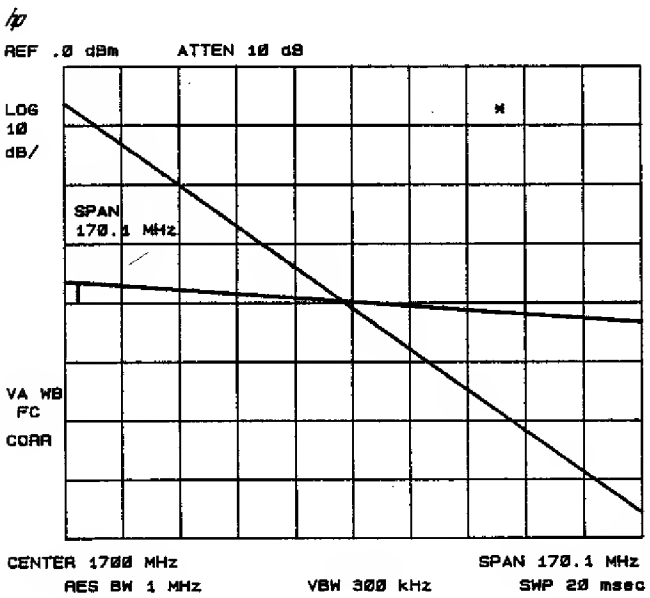
Output of A7U17, signal XFTUNE, block F in Figure 5–10 (continued)

[BINARY SPAN] Routine



a. At minimum span of 1700 MHz. Rotate RPG CCW after pressing **SPAN** *to show change in output.*

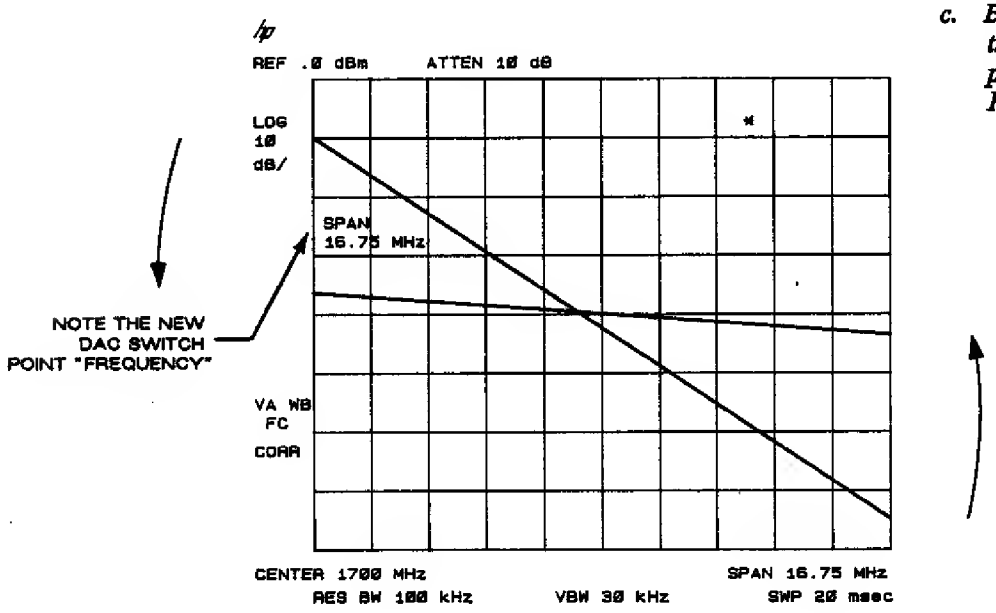
THE LINE ROTATES THROUGH THE DAC SWITCH POINTS (4 TIMES) AS THE ANALYZER IS TUNED DOWN IN SPAN. THE SWITCH POINTS ARE 17 MHz, 1.7 MHz, AND 170 kHZ.



b. Binary span DAC rotating through first switch points. Line rotates as shown as RPG is rotated.

Output of A7U18, signal BIN_SPAN, Block F of Figure 5-10

[BINARY SPAN] Routine (continued)



c. Binary span DAC roating through remaining switch points. Line rotates as RPG is rotated.

Output of A7U18, signal BIN_SPAN, Block F of Figure 5-10

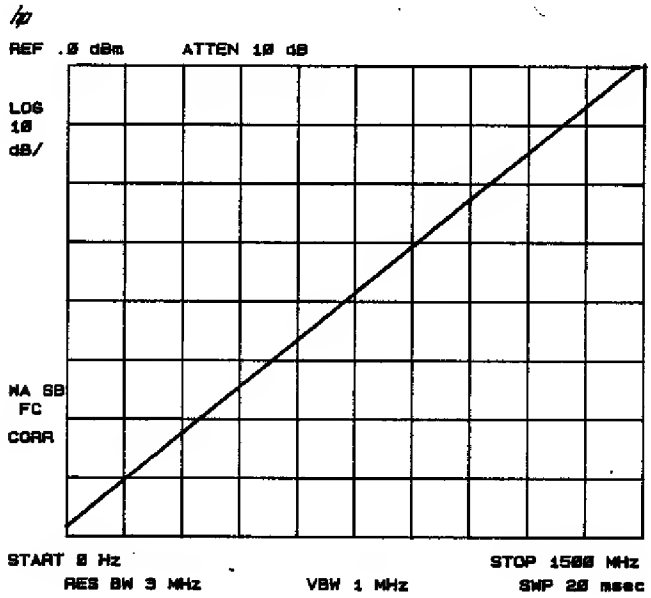
The binary span DAC is divided into five decade ranges. The processor controls multiplexers U31A and U32B. The multiplexers switch the output of A7U18 across resistors R5, R6 , and R7 to set up these ranges:

FM Coil Spans	Main Coil Spans > 17 MHS
1 kHz to 170 kHz	17 MHz to 170 MHz
170 kHz to 1.7 MHz	170 MHz to 1700 MHz
1.7 MHz to 17 MHz	

The analyzer also has a zero span where the YIG oscillator is not swept, and the analyzer can be manually tuned to any frequency in the 10 kHz to 1500 MHz range by turning the RPG.

[SWEEP RAMP] Routine

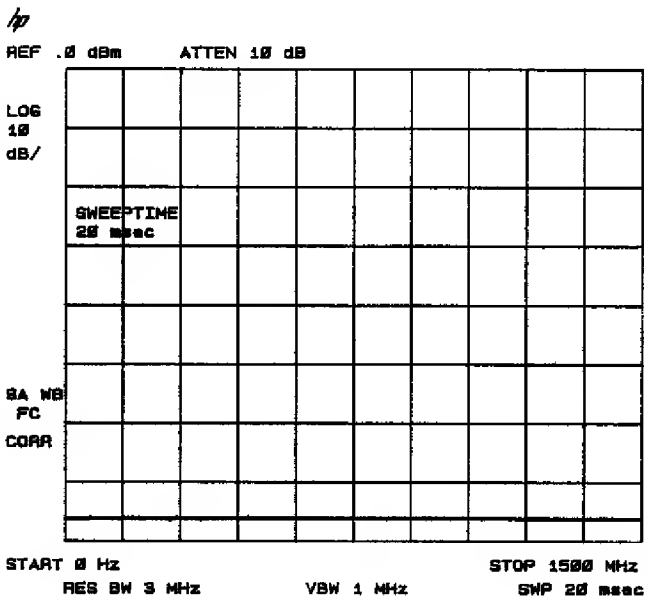
Press Preset



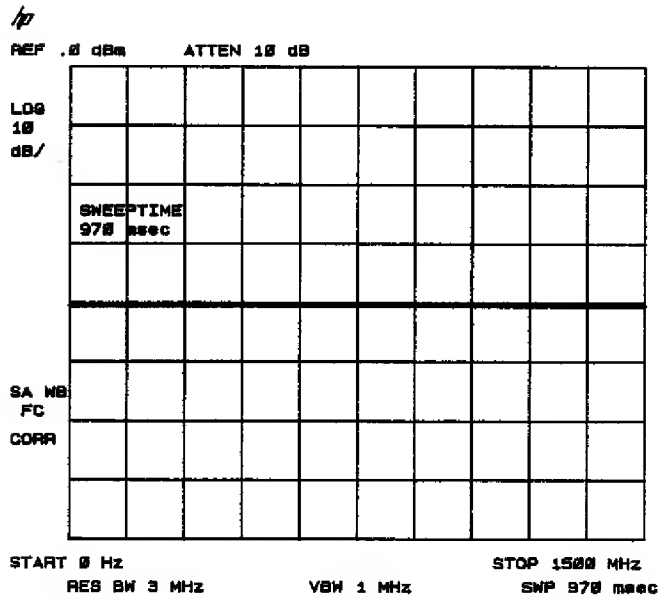
Output is shown after running [CAL FREQ] and [CAL AMPTD] routines and resetting the analyzer. Ramp goes from –10V to +10V.

Output of A7U20, signal SWP_RMP, block I of Figure 5–10

[SWEEP TIME DAC] Routine

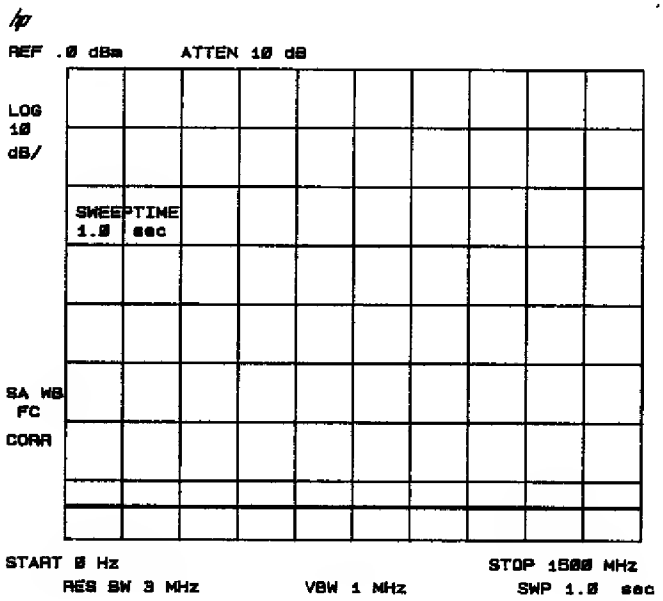


a. For sweep range = 20 ms.

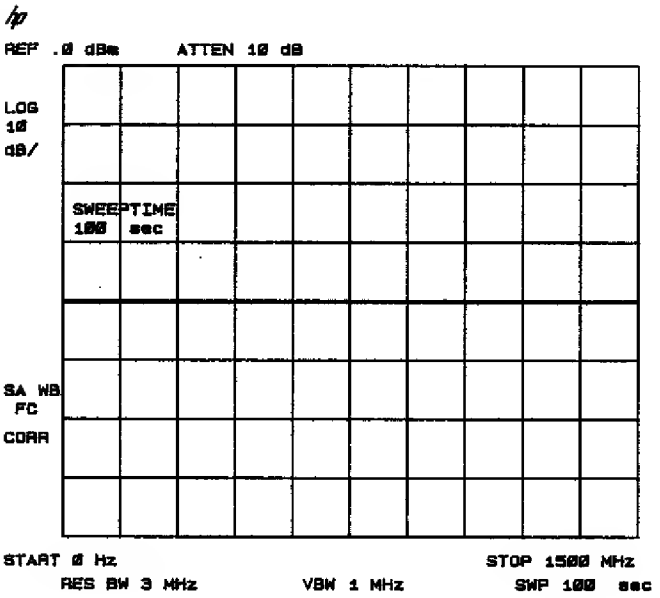


b. For sweep range = 970 ms.

Output of A7U19, signal SUP_DAC, block H of Figure 5–10



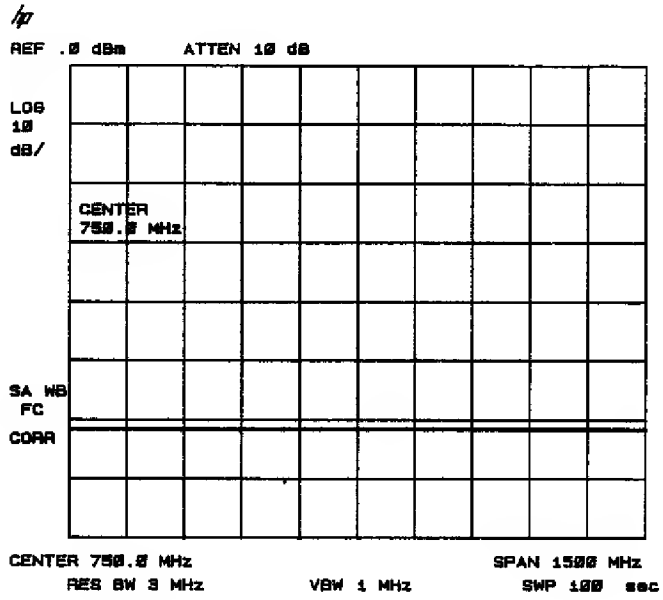
c. *For sweep range = 1.0s.*



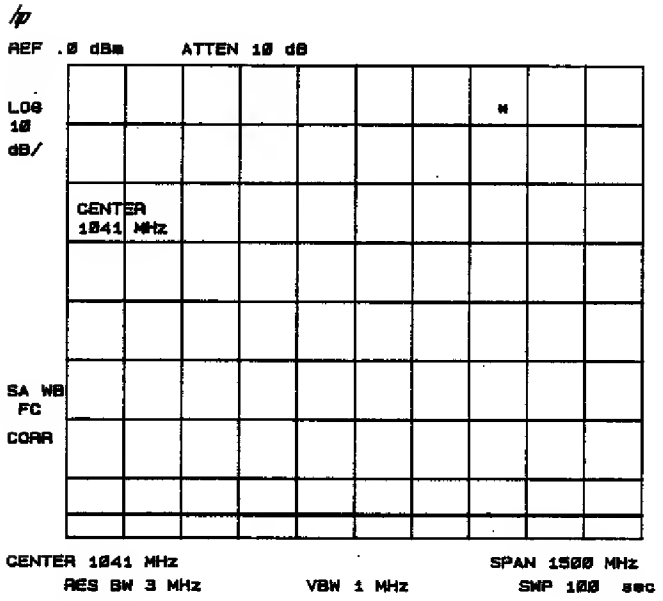
d. *For sweep range = 100s.*

Output of A7U19, signal SWP_DAC, block H of Figure 5–10 (continued)

[FINE TUNE DAC] Routine



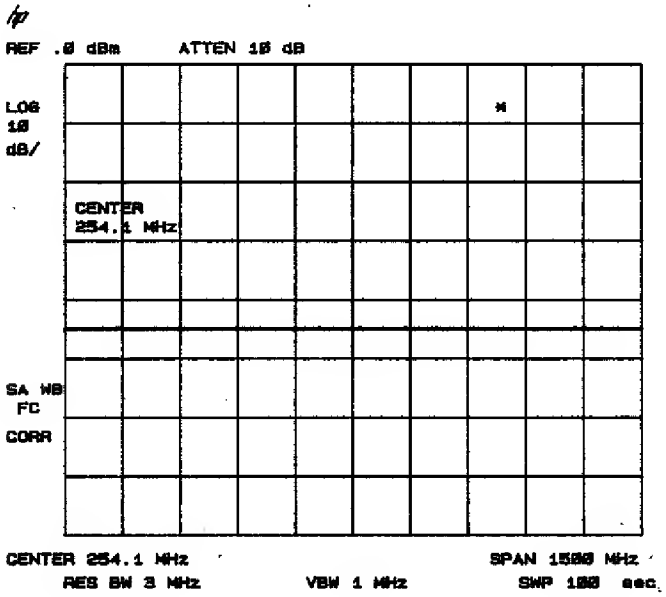
a. After presetting the analyzer and pressing [FINE TUNE DAC] and FREQUENCY



b. At 1041 MHz. Notice when turning the RPG, the output jumps from higher to lower levels at each end of DAC range. This is due to overlap of 4 bits of each of the 12-bit DACs (A7U15 and A7U16) to A7U12, the extra fine tune DAC.

Output of A7U25, signal FTUNE, block A of Figure 5–10

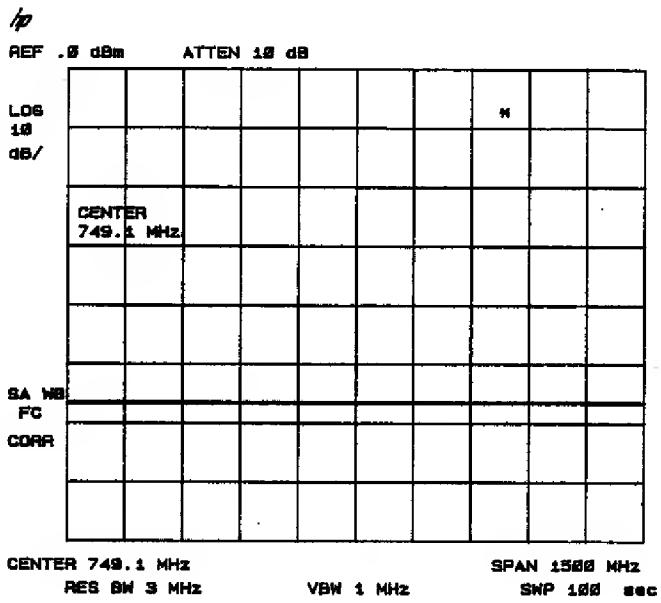
[FINE TUNE DAC] Routine (continued)



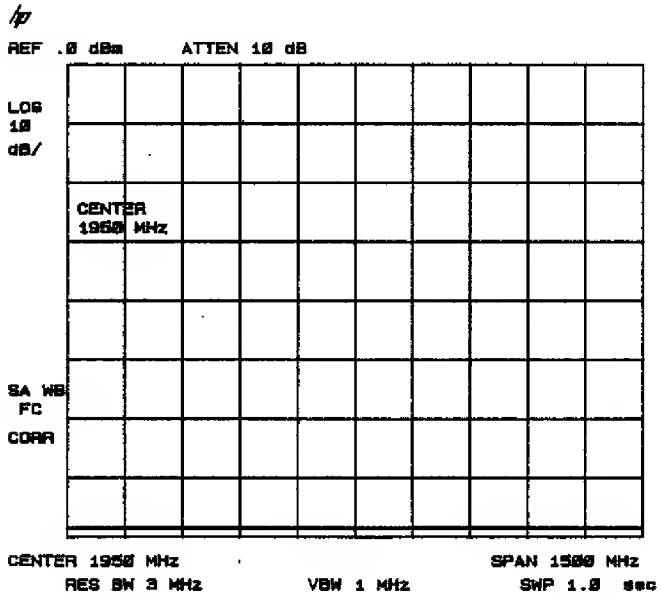
c. *At 254.1 MHz. The output jumps level at this end of range as shown by B.*

Output of A7U25, signal FTUNE, block A of Figure 5–10 (continued)

[COARS TUNE DAC] Routine



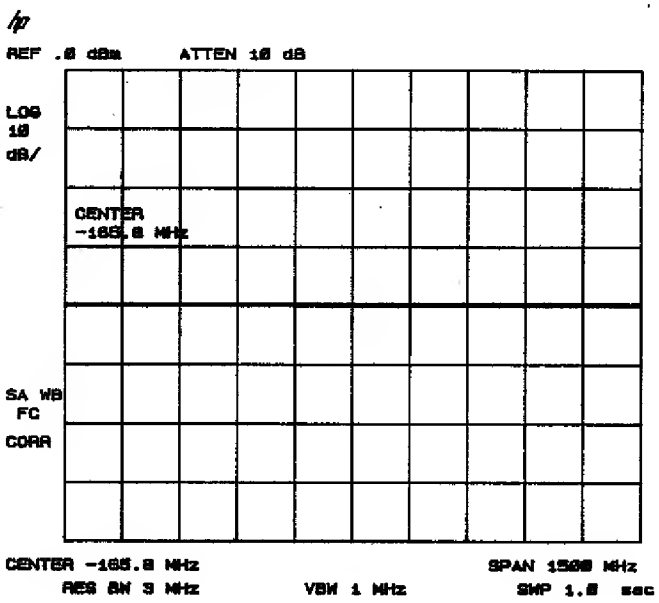
a. After presetting analyzer and pressing [COARSE TUNE DAC] and FREQUENCY



b. At maximum frequency (--10V).

Output of A7U21, signal CTUNE, block A of Figure 5–10

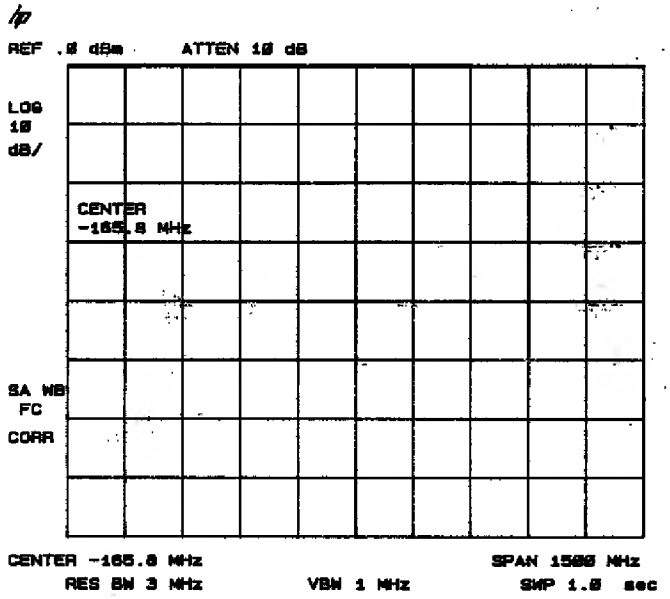
[COARSE TUNE DAC] Routine (continued)



c. At minimum frequency (-0V).

Output of A7U21, signal CTUNE, block A of Figure 5–10 (continued)

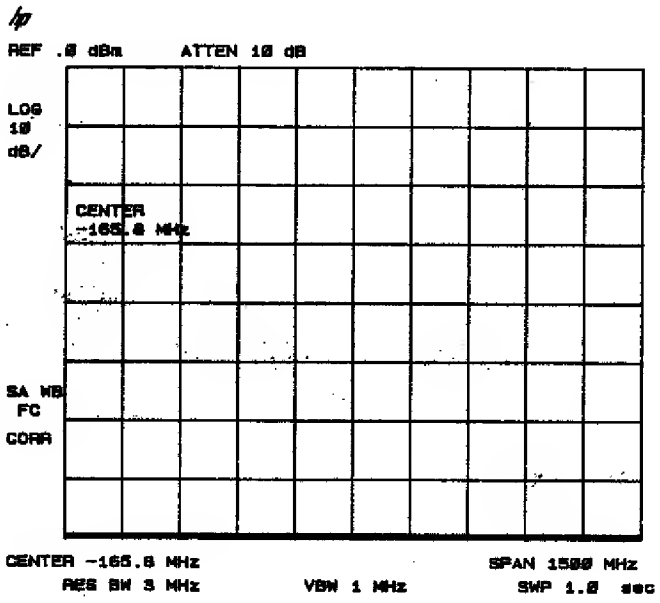
[+10V REF DETECTOR] Routine



See A16 Blk M

Checking I 10VF Blk B

[-10V REF DETECTOR] Routine



Note: The remaining softkeys of this menu, AUX A, AUX B, and DROOP, are not used at this time.

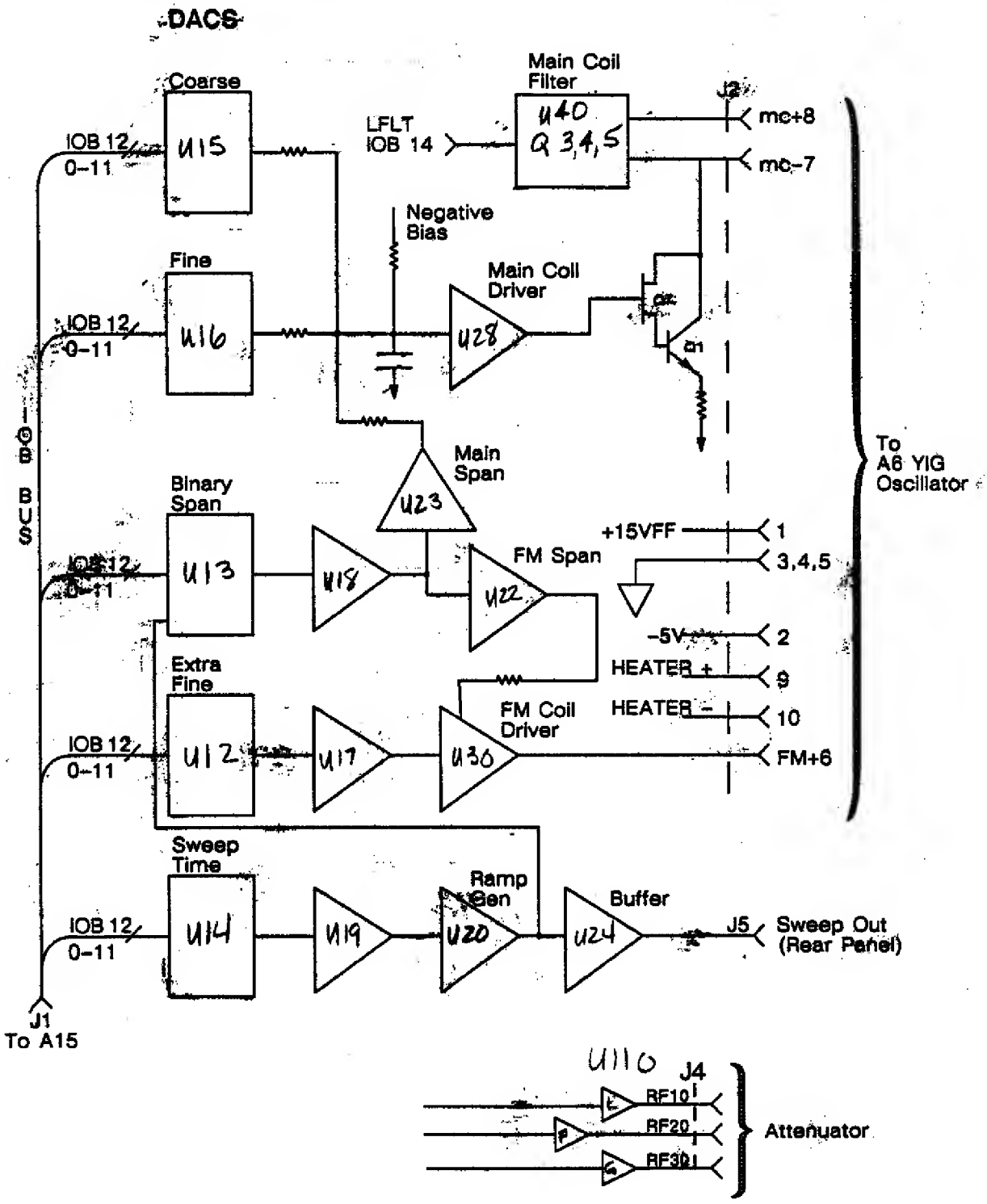


Figure 5-8. Analog Interface (A7) Block Diagram

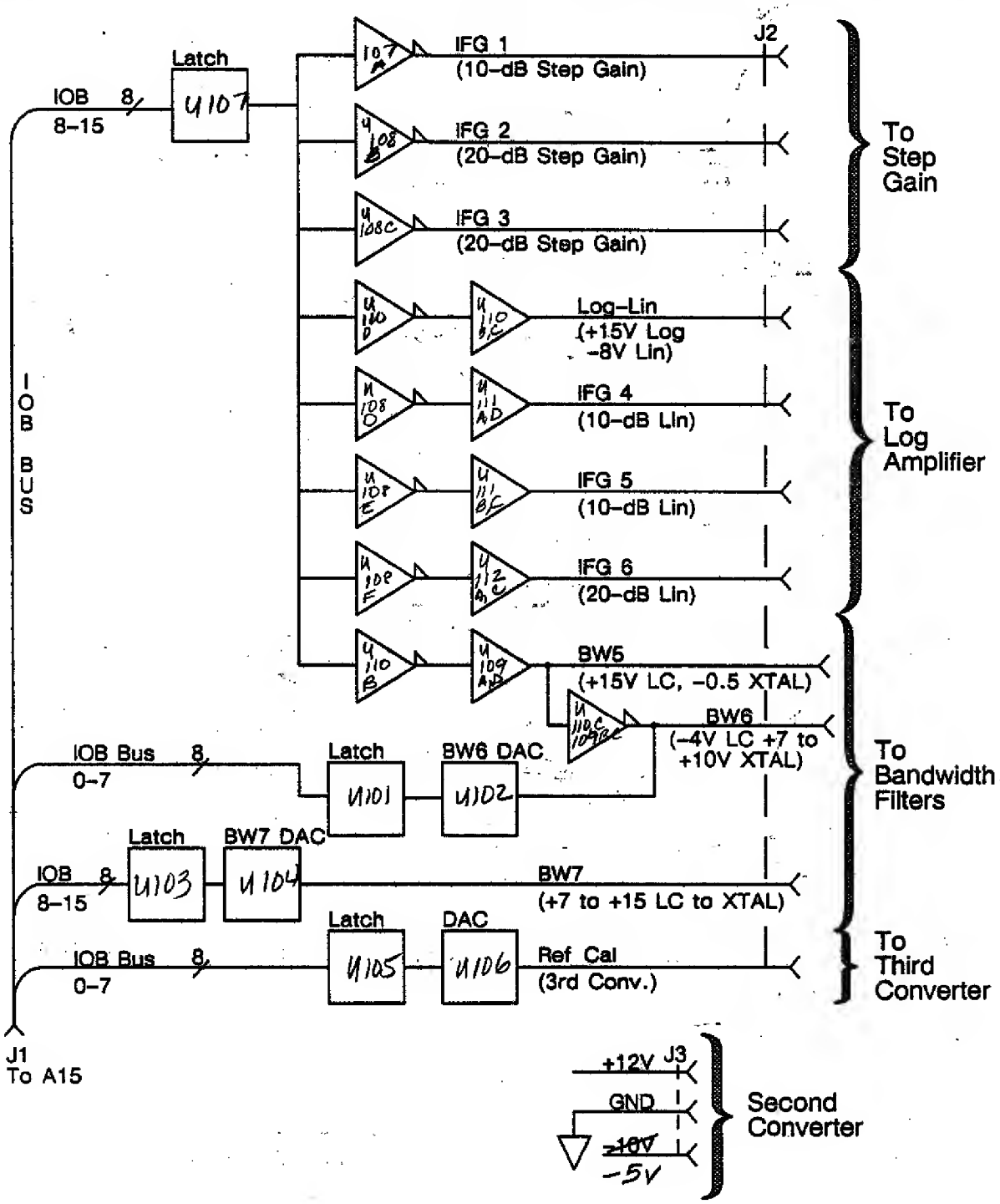


Figure 5–8. Analog Interface (A7) Block Diagram (continued)

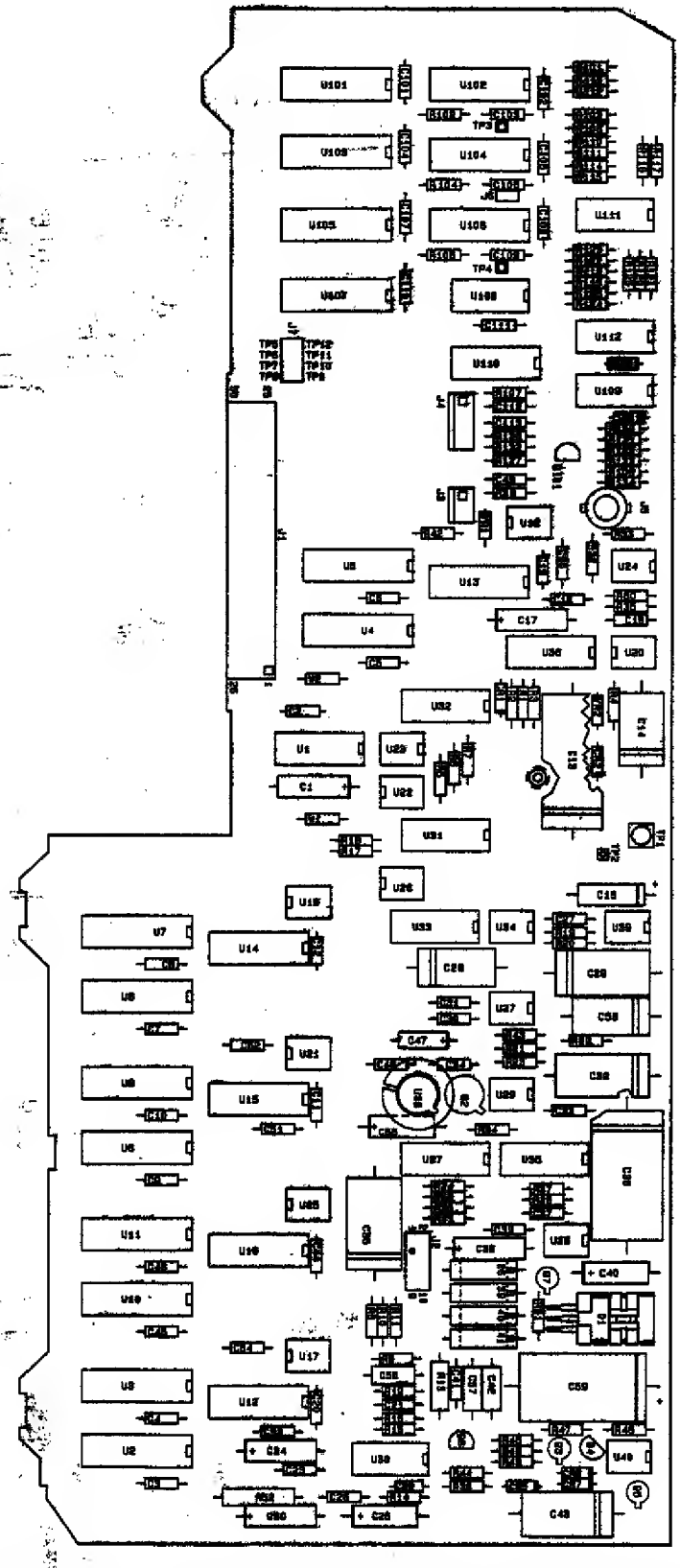


Figure 5–9. Analog Interface (A7) Component Locations

Third Converter Assembly A9

The Third Converter Assembly contains the third mixer/filter, the Third Local Oscillator buffer amplifier, a buffer amplifier, and a CAL amplifier (Figure 5–11). The double–balanced third mixer produces sum and difference images, as do other mixers, but rejects input and LO frequencies. This simplifies the subsequent filtering. The third LO, fixed at 299.9 MHz, when mixed with 321.3–MHz second IF, produces a difference frequency of 21.4 MHz, the final IF signal. The final IF signal passes through a matching filter to the buffer amplifier. The CAL amplifier provides reference level and frequency response compensation. The calibrated gain of the IF amplifier is set up by the REF_CAL current received from the Analog Interface Assembly.

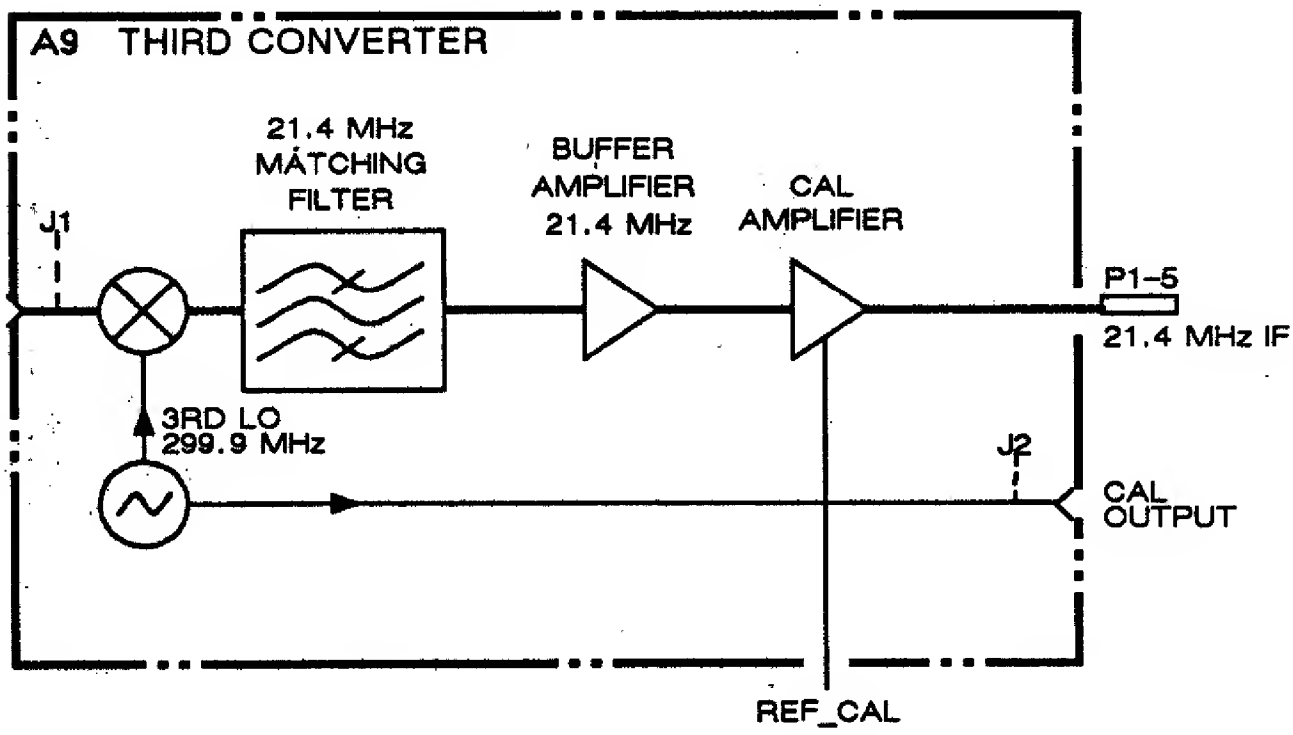


Figure 5–11. Third Converter Block Diagram

Detailed Description

The 321.3–MHz second IF signal from A10 is mixed with the 299.9–MHz signal from the Third Local Oscillator in balanced mixer A9U3. The output from the mixer is the difference frequency, 21.4 MHz, which is applied to the matching filter. The matching filter is a 21.4–MHz bandpass filter that also acts as an inter–stage impedance matching device.

The signal is amplified by the 21.4–MHz buffer and CAL amplifiers and coupled to the First Bandwidth Filter Assembly. The REF_CAL signal from A7 DAC U106 is controlled by the processor to compensate for frequency response flatness and 1–dB gain steps for reference level control. The 21.4–MHz third IF output signal is coupled to the input of the First Bandwidth Filter. The 299.9–MHz oscillator also provides the front panel CAL OUTPUT 299.9–MHz –20 dBm signal. It is sometimes necessary to select a different value for R9 to provide the –20 dBm CAL OUTPUT level while maintaining the proper input level to the balanced mixer.

Third Local Oscillator (A)

The Third Local Oscillator is a modified Colpitts circuit with a 299.9–MHz surface acoustic wave resonator (SAWR) A9Y1 in the positive feedback path to provide increased frequency stability. Inductor A9L3, connected in parallel with the SAWR, tunes out the SAWR shunt capacitance.

The oscillator–tuned circuit consists of capacitors A9C2, C3, and inductors L1 and L2. This tuned circuit ensures that the oscillator oscillates only on the proper overtone of the SAWR. Although A9L1 is called the LO FREQ adjustment, it is used to adjust for maximum local oscillator output power and has only a slight effect on the output frequency.

Inductor A9L3 provides a dc path for the base bias of buffer amplifier A9Q2. Diodes A9CR1 and CR2 provide temperature compensation for the 299.9–MHz oscillator and indirectly stabilize the CAL OUTPUT level. Power output from the oscillator through L2 transforms the output to approximately 50 ohms at a level of 0 dBm.

The output level of the circuit is controlled by CALIBRATOR LEVEL adjustment A9R4, which sets the emitter current of A9Q1, and allows adjustment for a –20 dBm, 299.9–MHz front–panel CAL OUTPUT level. It is sometimes necessary to select a different value for A9R3 to provide the proper Third Local Oscillator output level.

Buffer amplifier A9Q2 provides isolation for the 299.9–MHz oscillator and provides about 10 dB of power gain to the L port of balanced mixer U3. The buffer amplifier also provides the proper output level to the front–panel CAL OUTPUT by selecting A9R9 for a given balanced mixer input.

Balanced Mixer (Third Mixer) (B)

The Third Local Oscillator 299.9–MHz input to the L port of the balanced mixer is approximately +10 dBm. The level of the 321.3–MHz second IF signal inputs to the R port of the mixer is approximately –12 dBm ~~or less~~. The third mixer output is the 21.4–MHz difference frequency, produced by heterodyning the 321.3–MHz IF and the 299.9–MHz LO. The third mixer has a conversion loss of about 7 dB.

Matching Filter

The output of the balanced mixer is applied to the matching filter, which consists of A9L5, L6, L7, C7, C8, C9, C10, R11, R12, R13, and R14. The matching filter is a 21.4–MHz bandpass filter that also serves as an impedance matching network. The circuit raises the low (-10 ohms) input impedance of the 21.4–MHz amplifier to match the higher (-50 ohms) output impedance of the balanced mixer.

21.4–MHz Buffer Amplifier (C)

The 21.4–MHz buffer amplifier consists of A9Q4 in a common–emitter configuration and A9Q3 for feedback and bias control. The output of the 21.4–MHz amplifier is passed to A9Q5 CAL amplifier.

CAL AMP (D)

The gain of A9Q5 CAL AMP is controlled by DAC A7U106 ~~to compensate for frequency response flatness.~~ A9Q5 also provides the 1–dB reference–level gain changes. The REF_CAL line from the Analog Interface Assembly changes the resistance of diode A9CR3 connected across R22 (ac signal path only, not dc bias). The change in resistance of A9CR3 changes the gain as needed of A9Q5. The gain of A 5 can be varied over 16 dB

Second IF Assembly A10

The Second IF Assembly contains an amplifier and bandpass filter for the second IF (see Figures 5–12 and 5–13). The amplifier provides about 12 dB of fixed gain to the incoming second IF signal. The amplifier output is passed through a 321.3–MHz bandpass filter, which rejects unwanted signals from the IF passband. The resulting signal is routed to the Third Converter Assembly.

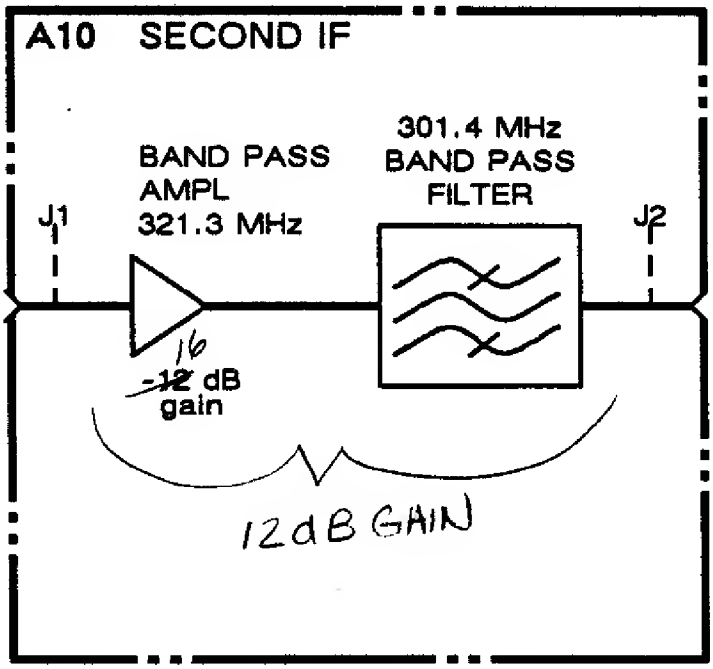


Figure 5–12. Second IF Block Diagram

Detailed Description

The Second IF Assembly contains a bandpass amplifier that provides a gain of approximately 16 dB at 321.3 MHz. It also contains a bandpass filter that provides further rejection of unwanted signals. The bandpass filter has a 3–dB loss, giving the Second IF Assembly a net gain of approximately 13 dB at 321.3 MHz. The 321.3–MHz IF output signal is coupled to the Third Converter Assembly. This signal is the input to the R port of the balanced mixer on the Third Converter Assembly.

Bandpass Amplifier (A)

The bandpass amplifier consists of A10Q2 in a common-emitter configuration, and A10Q1 connected to control the base drive and bias current of A10Q2. Capacitors A10C4, C5, C7, and C10 serve as decoupling for high frequencies. The gain of the bandpass amplifier is set by the high-frequency characteristics of A10Q2, R5, and the small amount of inductance on the emitter connection of Q2. The emitter inductance is used to establish a 50-ohm input impedance and to help stabilize the current gain of A10Q2. Resistor A10R5 is the output load resistance of A10Q2 and establishes an output impedance of about 500 ohms.

Components A10L2, C8, C9 and the collector capacitance (Cc) of Q2 form the collector tank circuit (see Figure 5-14). This tank circuit determines the center frequency of the bandpass amplifier and transforms the 500-ohm output impedance at the collector of A10Q1 down to 50 ohms. The output of the bandpass amplifier goes from A10C9 through a 50-ohm microstrip transmission line etched on the printed circuit board to the bandpass filter. The bandpass amplifier has a gain of about 16 dB from the base of A10Q2 to the 50-ohm output of A10C9.

Bandpass Filter (B)

The output of the bandpass amplifier passes through a 321.3-MHz bandpass filter. The bandpass filter is made up of A10L3, L4, L5, C11, C12, C13, C14 and adjustable piston-type capacitors A10C1, C2, and C3. Capacitors A10C11 and C15 are used to transform the bandpass filter input and output impedance to 50 ohms. Inductors A10L3, L4, and L5 are wound on a common coil form that provides mutual inductance coupling between filter sections. The bandpass filter has an insertion loss of approximately 3 dB and a 3-dB bandwidth of about 12 MHz.

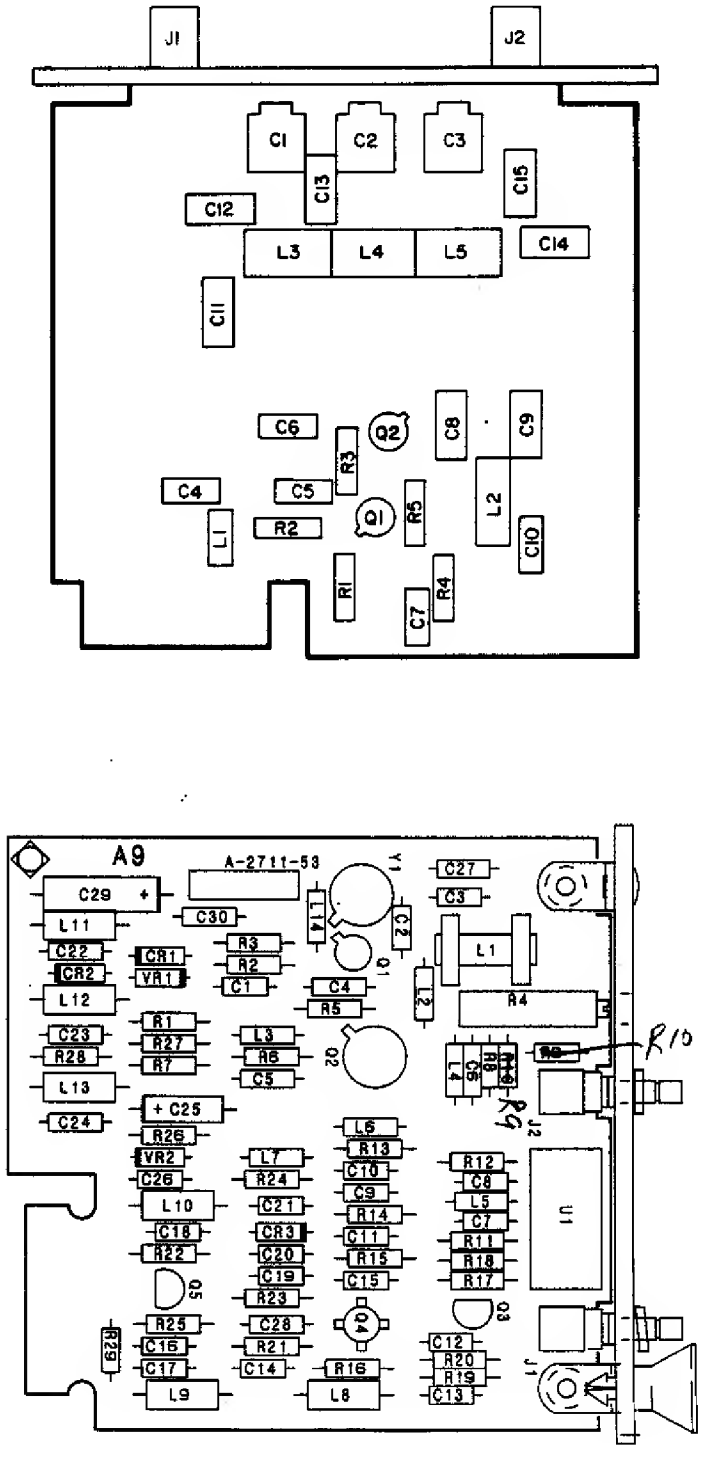
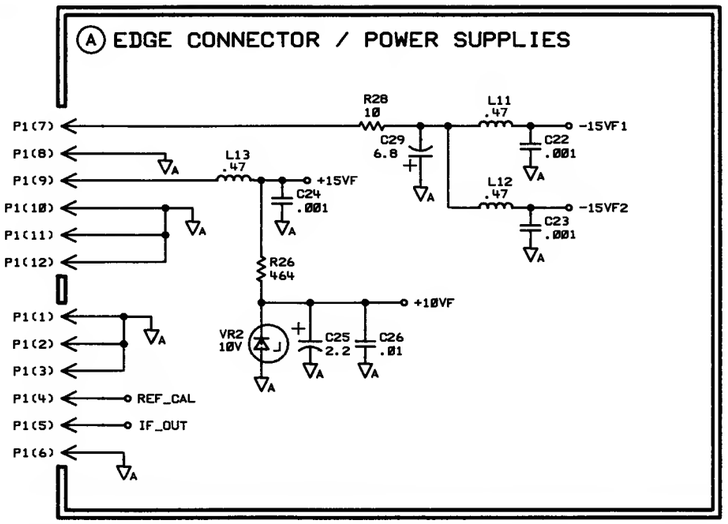


Figure 5-13. Third Converter, Second IF Component Locations

08590-60073



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS (Ω)
CAPACITANCE IN MICROFARADS (μF)
INDUCTANCE IN MICROHENRIES (μ)

3. MNEMONIC TABLE

MNEMONIC	DESCRIPTION
+15VF	+15 VOLT SUPPLY
-15VF1	-15 VOLT SUPPLY #1
-15VF2	-15 VOLT SUPPLY #2
REF_CAL	REF LEVEL CAL CONTROL
IF_OUT	21.4 MHz IF OUTPUT

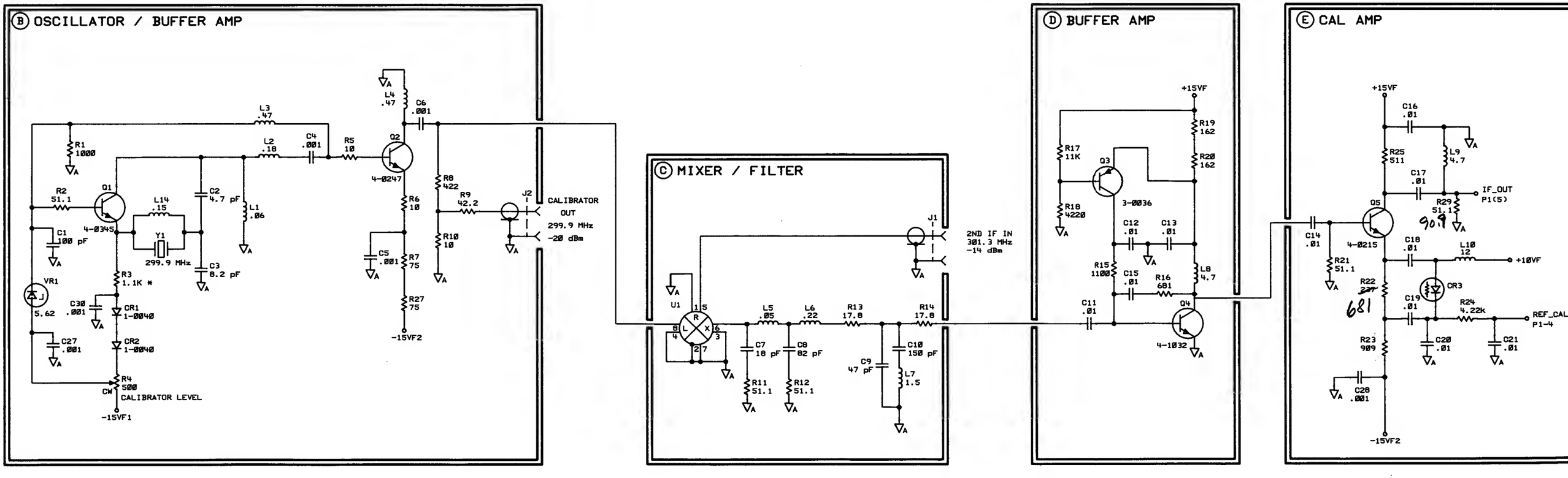
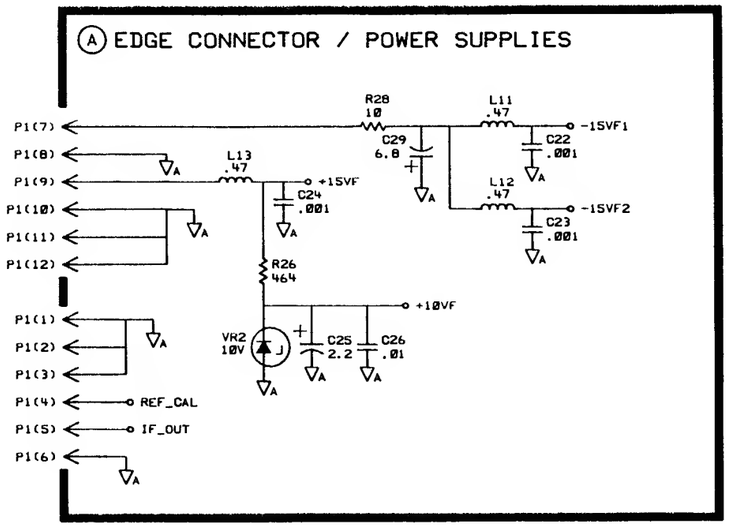
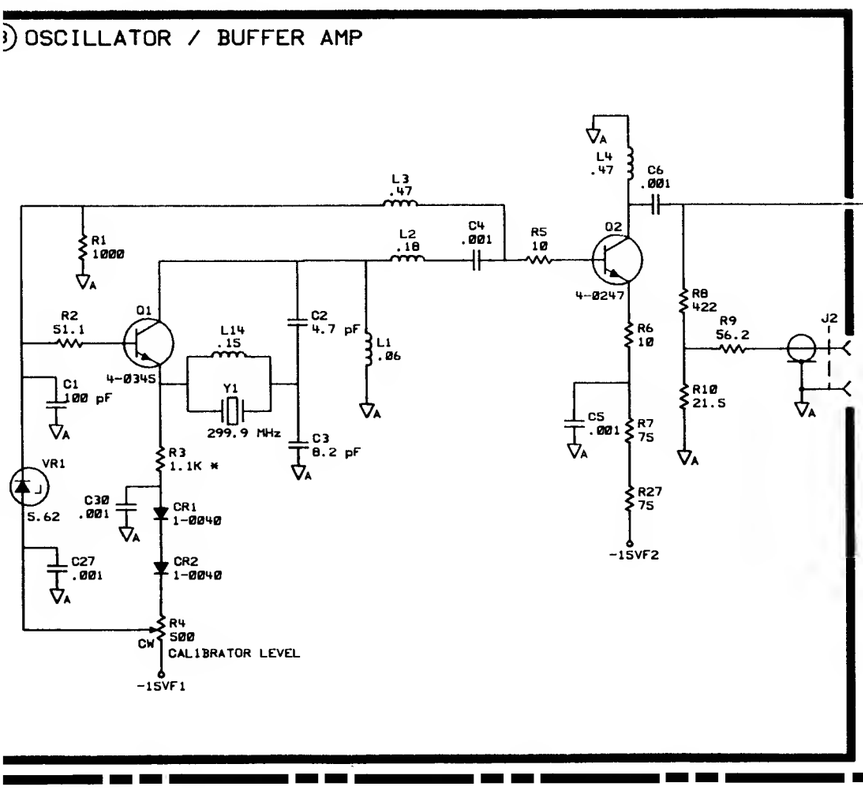
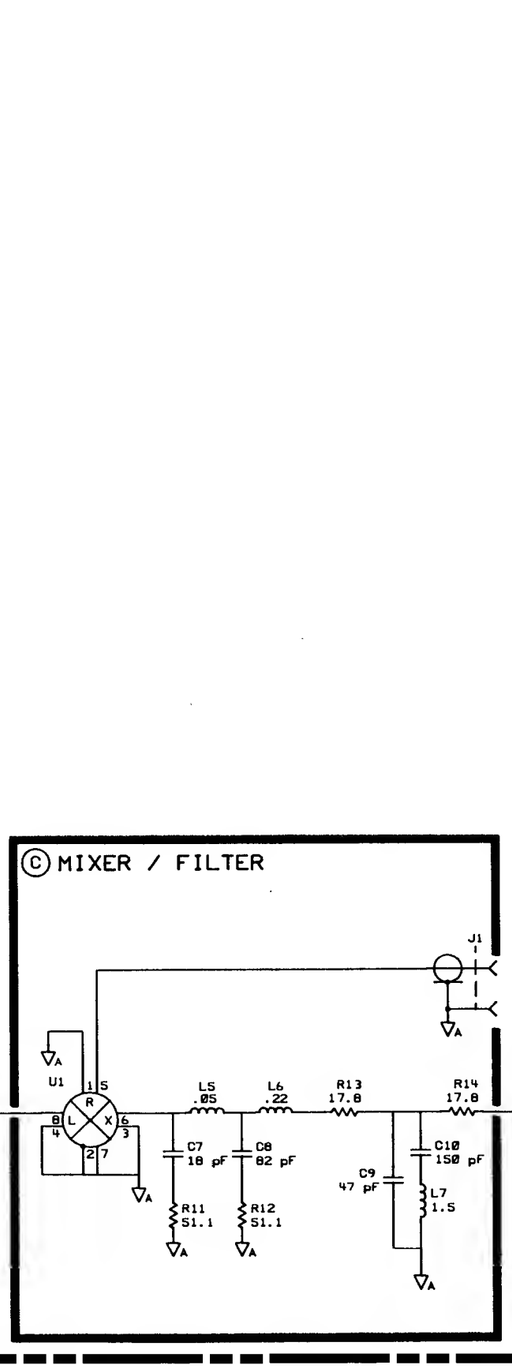


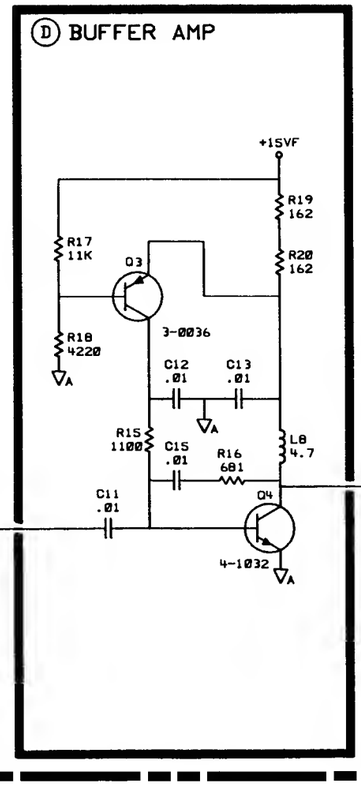
Figure 5-14. Third Converter Assembly (A9), Schematic Diagra

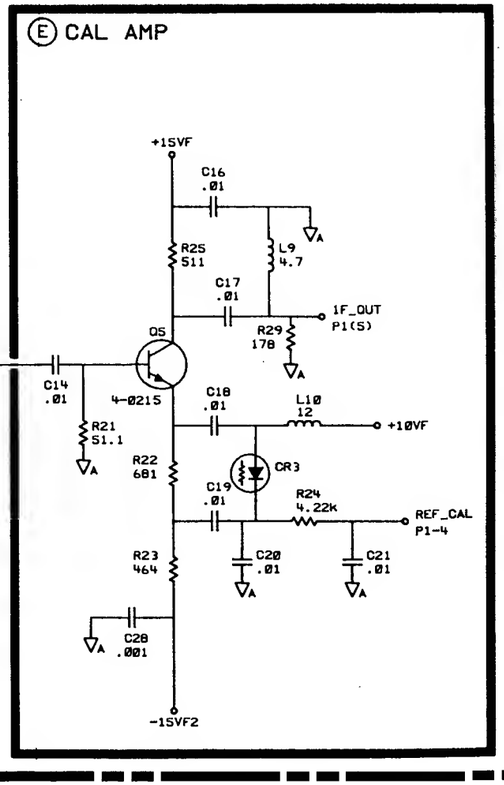
ONVERTER OPTION -Ø01 BOARD ASSEMBLY
3









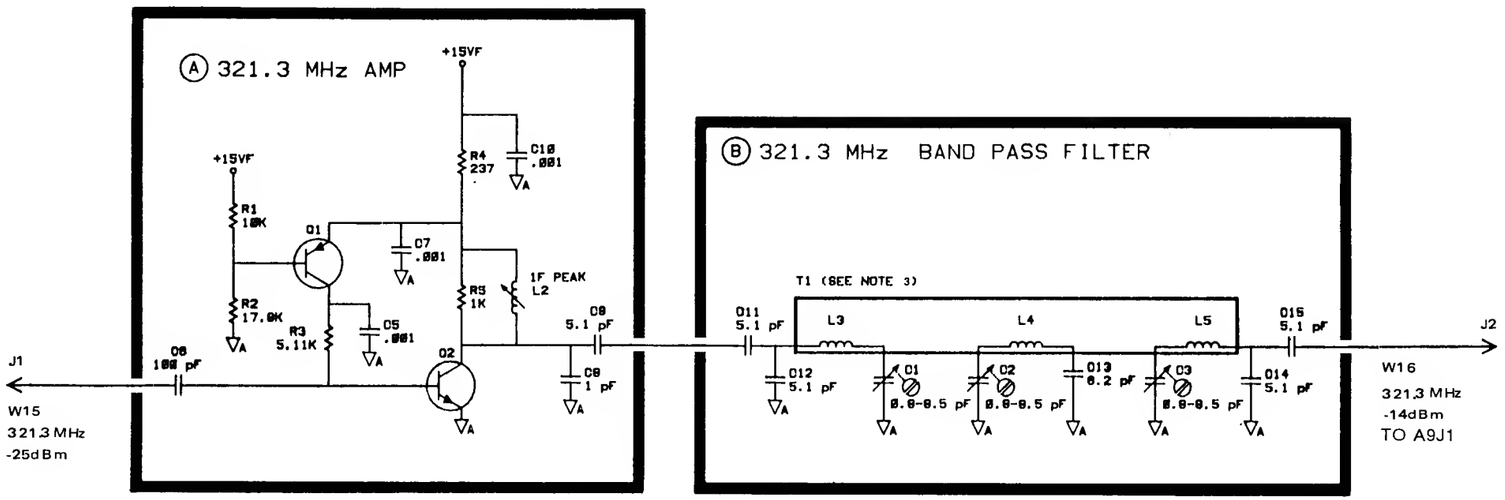


2A & ABOVE

Figure 5-14.1. Third Converter Ass

A10 SECOND IF
08590-60055

PIN	SIGNAL
1	GND
2	GND
3	GND
4	GND
5	GND
6	GND
7	GND
8	GND
9	GND
10	GND
11	+15 VF
12	GND



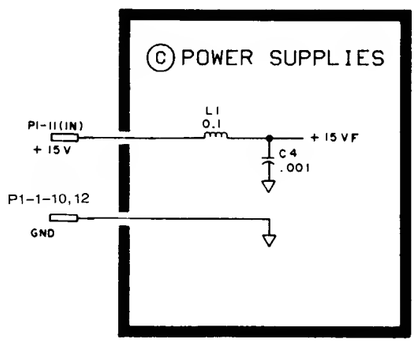


Figure 5-14.2. Second IF Assembly (A10), Schematic Diagram 5-61/5-62

First and Second Bandwidth Filters A11 and A13

The Bandwidth Filter Assemblies are identical. Each assembly contains two synchronously tuned filter poles isolated by buffer amplifiers (see Figure 5–15). Unlike stagger–tuned poles, the filter poles have identical center frequencies. The bandwidth of all four filter poles is changed synchronously by the resolution bandwidth selected on the analyzer front panel using the [RES BW] soft key. The currents that control bandwidth selection are received from the Analog Interface Assembly A7. Because the variable bandwidth filters are much narrower than the filters in the RF section, the selected resolution bandwidth value determines overall analyzer bandwidth. LC filters provide bandwidths from 3 MHz to 100 kHz. Crystal filters provide the narrow (30 to 1 kHz) bandwidths. The bandwidth filters have a Gaussian bandpass characteristic.

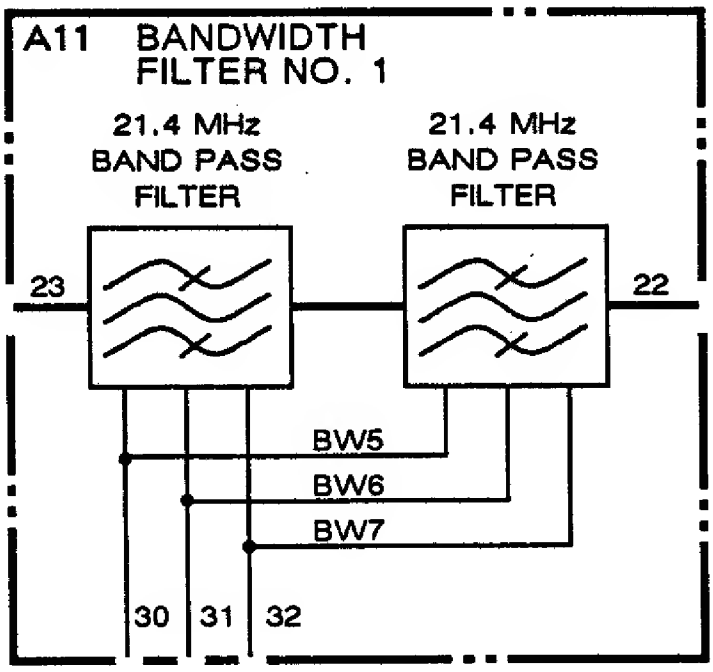


Figure 5–15. Bandwidth Filter Block Diagram

Detailed Description

The Bandwidth Filter Assemblies operate at 21.4 MHz with eight available bandwidths: 3 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, or 1 kHz. Four stages of filtering are used for all eight bandwidths; each assembly contains two stages. The bandwidths from 1 kHz to 30 kHz are obtained from synchronously tuned crystal filters; the remaining four bandwidths (100 kHz to 3 MHz) use synchronously tuned LC tank circuits.

The four crystal-filter stages contain factory-selected matched crystals (A11Y1, A11Y2, A13Y1, and A13Y2) that must be replaced as a set. If replacement of a bandwidth filter assembly is necessary, the new assembly is shipped with two crystals installed and two packaged separately to replace the crystals on the other assembly. In addition to the filter stages, each board contains a 10-dB Buffer Amplifier, a Unity Gain Buffer Amplifier, and an Output Buffer Amplifier.

10-dB Input Buffer Amplifier (B)

The 10-dB Input Buffer Amplifier is shown as a noninverting operational amplifier in Figure 5-16. Gain for the amplifier is expressed by the equation:

$$\text{gain} = 1 + R_f/R_{in}$$

The total resistance of R5, R6, and R7 forms the feedback path (R_f); R3 forms the input resistance (Rin). This ac model of the amplifier's operations is true for all but the narrowest bandwidths, as illustrated later.

Two current paths are used for dc bias in the input buffer amplifier: one for crystal filter poles, another for LC filter poles. When a crystal-filtered bandwidth of less than 30 kHz is selected, Q3 (block D) and Q1 are the sources for the current through Q2 (see Figure 5-17). The base voltage of Q2 is fixed by the divider R9 and R10, while the emitter is fixed by R8. The collector, therefore, becomes a constant-current sink for 20 mA of current supplied by Q1 and Q3. A decrease in the current supplied by Q3 results in increased current through Q1, keeping the current through Q2 constant. If an LC-filtered bandwidth is selected, BW5F (filtered bandwidth control line 5 in block C) supplies current via CR1 and R13 (see Figure 5-18); Q3 is effectively removed from the circuit.

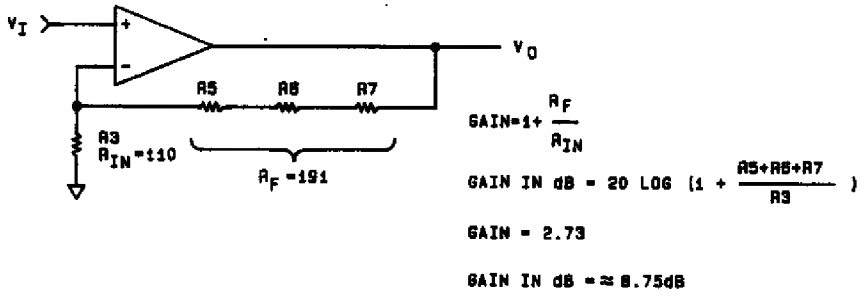


Figure 5-16. 10-dB Input Buffer Amplifier Gain Model

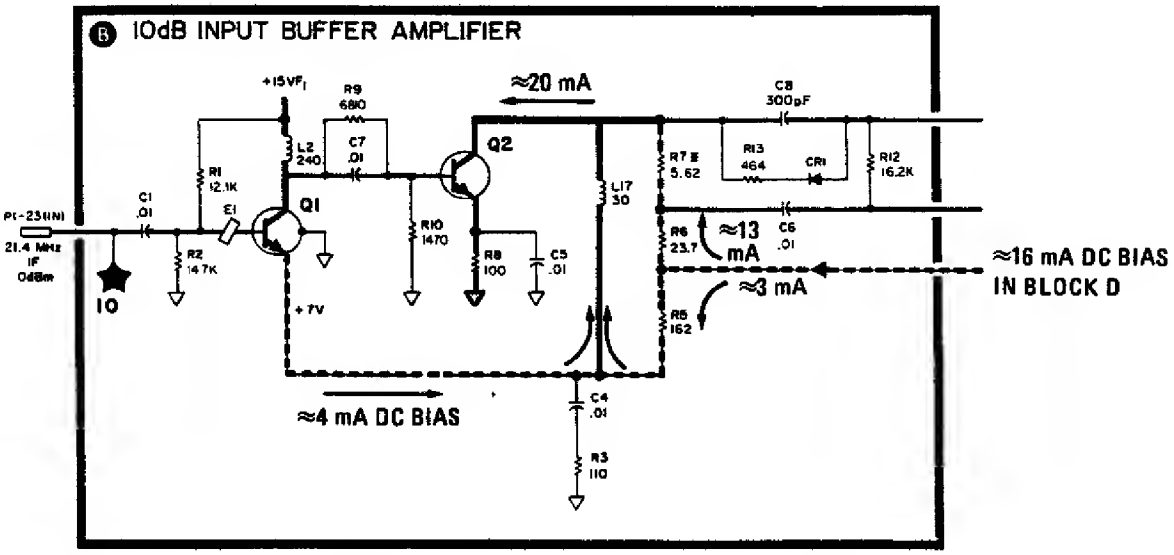


Figure 5–17. DC Bias Path During Crystal Pole Operation

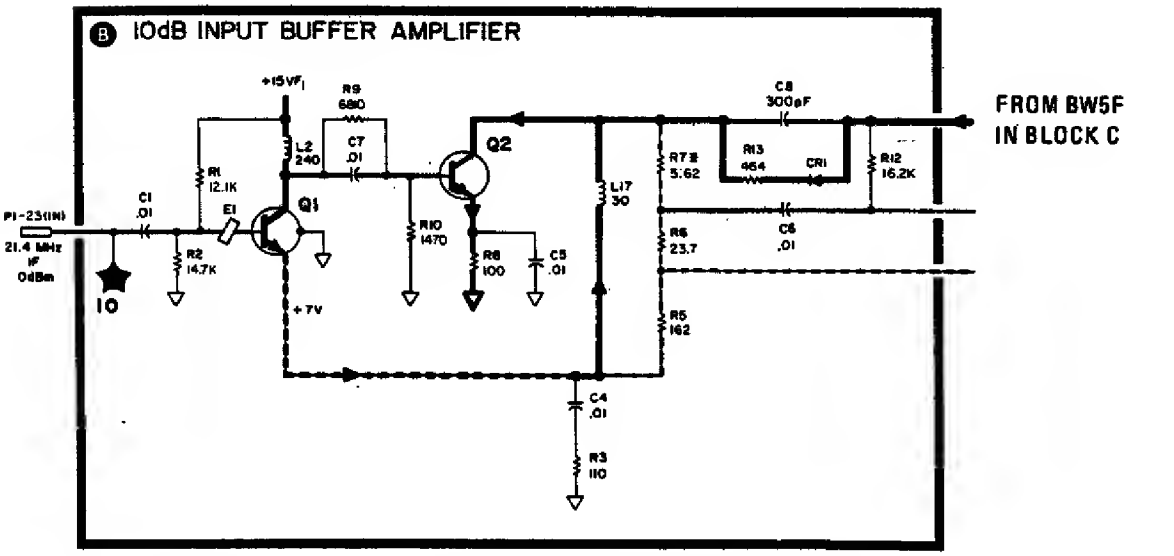


Figure 5–18. DC Bias Path During LC Pole Operation

A different model is needed for crystal filtering modes (see Figure 5–19). Resistor R7 has been omitted to simplify the model. The emitter load of Q3 (R_t) is the series combination of the internal resistance of Y1 (R_S) and a resistance determined by the bandwidth selected (see First Xtal Pole description). The crystal's series resistance at resonance (R_S) is constant at about 10 ohms. In the 30–kHz bandwidth, R23* is in series with R_S. Since R23* is very large by comparison, it represents the total load on Q3 (R_t). When R23* is substituted into the gain equation for R_t, a gain of 2.7 (8.6 dB) results. This is roughly equal to the gain without Q3 in the circuit. In fact, the larger R_t becomes, the closer the gain becomes.

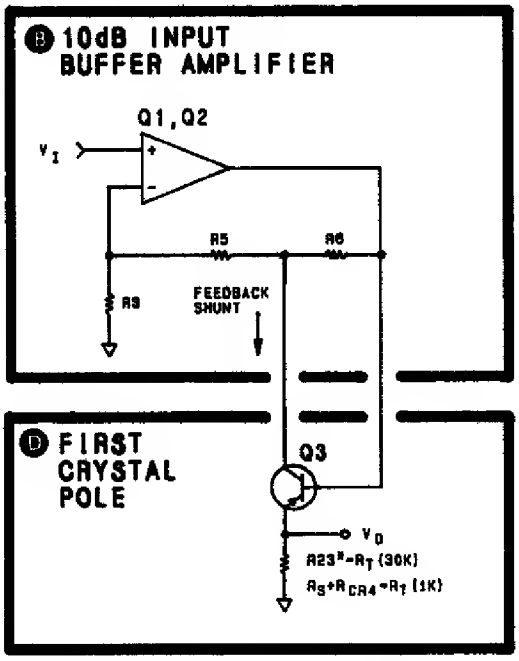
When the 1–kHz bandwidth is selected, CR4 is biased on and has a resistance of about 60 ohms. This resistance forms a voltage divider with R_S and results in signal amplitude loss across the crystal. Increased gain in the input buffer amplifier, caused by the load on Q3, compensates for these losses. The gain increase occurs when the reduction in the R_t turns Q3 on even harder, resulting in some of the feedback from R6 being shunted to ground through the collector of Q3. This reduction in negative feedback increases the gain of the input buffer amplifier. By substituting the 1–kHz bandwidth R_t (10 + 60 = 70 ohms) into the gain formula, a new gain of 4.0 (12 dB) is derived.

First XTAL Pole (D)

Crystal filtering is used for bandwidths of 1 kHz, 3 kHz, 10 kHz, and 30 kHz. Individual poles have a bandwidth about 2.3 times the selected bandwidth, and each filter board assembly (two poles combined) has a bandwidth of about 1.5 times the selected bandwidth. For example, when the 1–kHz bandwidth is selected, each pole has a 3–dB bandwidth of about 2.3 kHz, and each assembly has a bandwidth of 1.5 kHz. The signal from the input buffer amplifier is routed to Q3 and to compensation amplifier Q4. (The action of Q3 is discussed in the 10–dB Input Buffer Amplifier description.) From Q3, the signal is applied to the crystal (Y1) where it is filtered before going to the unity gain buffer amplifier.

The crystal functions as a series–resonant filter tuned to 21.4 MHz. An equivalent circuit is shown in Figure 5–20. Parallel capacitance C_O is the result of terminal and case capacitances in the crystal; R_S is the effective resistance at resonance (about 10 ohms). Both C_O and R_S are detrimental to the pole's performance, so compensation is used to nullify their effects. Because they are canceled, C_O and R_S are not shown in the simplified crystal pole schematic.

Pin diode CR4 (see Figure 5–21) controls the filter's bandwidth by functioning as a variable resistance at 21.4 MHz. The voltage applied to BW6F controls the current through CR4 and its resistance. An increase in current decreases the resistance and narrows the bandshape.



$$GAIN = \frac{1+\frac{R5+R6}{R3}}{1-\frac{R6}{R_t}}$$

FOR 30K BW:
When: R_t=8250 Ω

Then: $GAIN = \frac{1+\frac{185.7}{110}}{1-\frac{23.7}{82.50}}$ = 2.69 GAIN 2.70 ≃ 8.6dB

FOR 1K BW:
When: R_t=70 Ω

Then: $GAIN = \frac{2.69}{.66} \simeq 4.0 \simeq 12dB$

Figure 5–19. 10–dB Input Buffer During Crystal Pole Operation

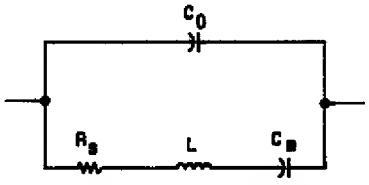


Figure 5–20. Crystal Model

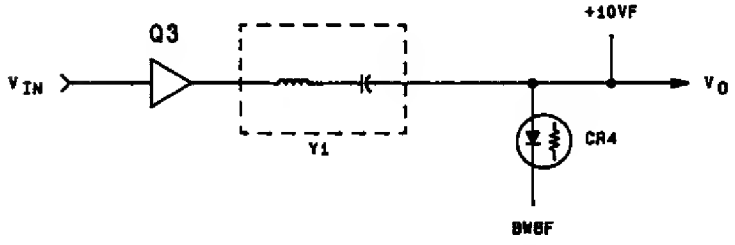


Figure 5–21. First Crystal Pole, Simplified Schematic

The crystal presents a low impedance (R_S) to the signal at resonance so that the signal voltage is developed across CR4. As the signal frequency varies from the 2.4–MHz center frequency the impedance of the crystal increases, making it part of a voltage divider with CR4 and causing more signal voltage to be developed across the crystal. The frequencies where crystal impedance and PIN diode resistance become equal are the 3–dB points of the bandpass. Varying the PIN diode resistance, therefore, varies the bandwidth.

The case capacitance of the crystal (C_O) would cause a second resonant point, or dip, in the bandpass if compensation were not used to nullify its effects. Compensation is provided by Q4 as a current equal to and opposite in phase with the current flowing through C_O, as shown in Figure 5–22. Capacitor C15 (SYM) adjusts the phase of the compensating current.

The sum of the input capacitances of the unity gain buffer, the trace capacitances, and the capacitance of the PIN diode causes the center frequency of the filter to be altered. Compensation is used to eliminate this effect. These capacitances are tuned out by including them in the parallel resonant circuit (at 21.4 MHz) formed with L7 and fine tuned by C25 (CTR). Adjusting C25 tunes the circuit to present a high impedance at resonance.

When LC filtering is selected, BW5F forward biases CR2, effectively grounding the emitter of Q3. During crystal filtering, CR2 is reverse biased.

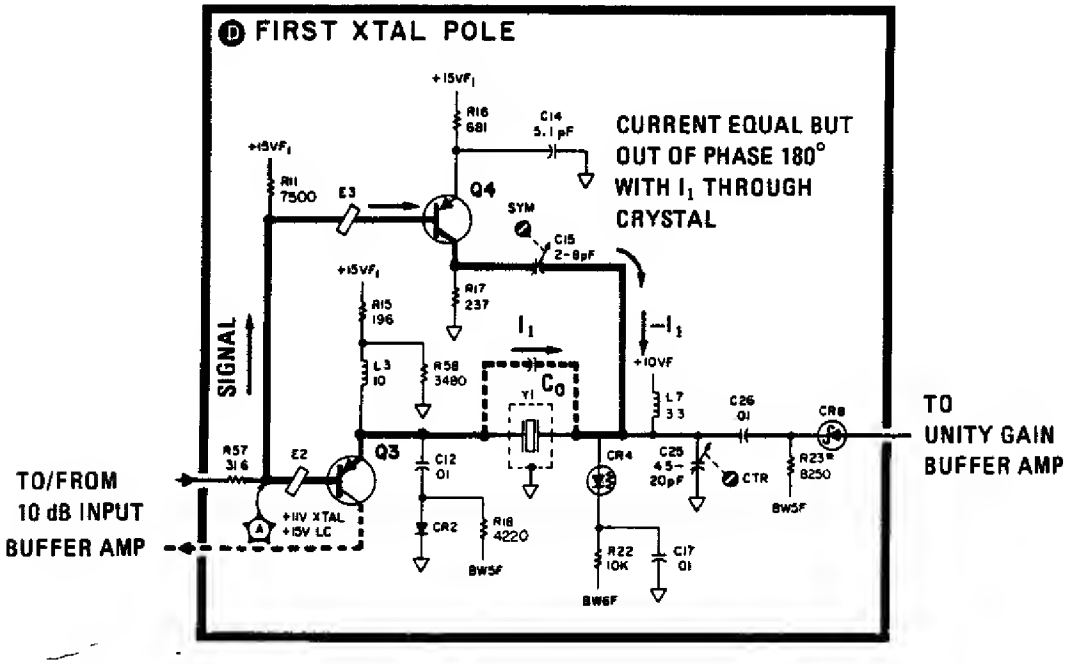


Figure 5–22. Compensation Amplifier

First LC Pole (C)

LC filtering is used for bandwidths of 100 kHz, 300 kHz, 1 MHz, and 3 MHz. The relationship of the individual pole's bandwidth to the selected bandwidth is the same as that of the crystal poles: 2.3 times per pole and 1.5 times per assembly. The LC filter pole comprises a metallized inductor (L6) in parallel with four capacitors: the series combination of C16* and C20*, C21 (temperature compensation), and C23 (center adjust). This resonant circuit is driven through CR3, which functions as a variable resistor. Bandwidth control line BW7F establishes the current through CR3 and thereby controls the pole's bandwidth. Feedback from the unity gain buffer replenishes losses in the resonant circuit.

A simplified model of the LC Pole is shown in Figure 5–23. At resonance, a voltage divider is formed between CR3 and the resonant circuit. The 3–dB points of the bandpass occur when the PIN resistance and the impedance of the resonant circuit are equal. Varying the PIN resistance varies the filter's 3–dB points. The higher the PIN resistance, the narrower the bandwidth. When the 100–kHz bandwidth is selected, CR3 is reverse biased and R19* sets the bandwidth; if one of the other bandwidths is selected the parallel combination of R19* and CR3 is utilized. The intrinsic capacitance of PIN diode CR3 affects the bandpass, if it is not compensated for. Adjustable capacitance C73 (LC DIP) and L5 are in parallel with the PIN capacitance and allow it to be tuned out of the circuit.

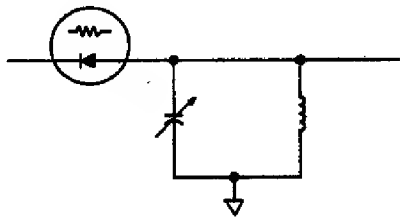


Figure 5–23. LC Pole Model

A simplified schematic of the first LC pole is shown in Figure 5–24. The fundamental frequency–determining components are L6 and the center–tapped capacitance C16* and C20*. Positive feedback is applied to the center–tap at 21.4 MHz to compensate for losses in the tank circuit. The feedback makes it important that C16* and C20* be the same value for proper pole operation. The feedback level is controlled by CR5, acting a a variable resistance. LC feedback control R26 establishes the current through CR5 and its resistance.

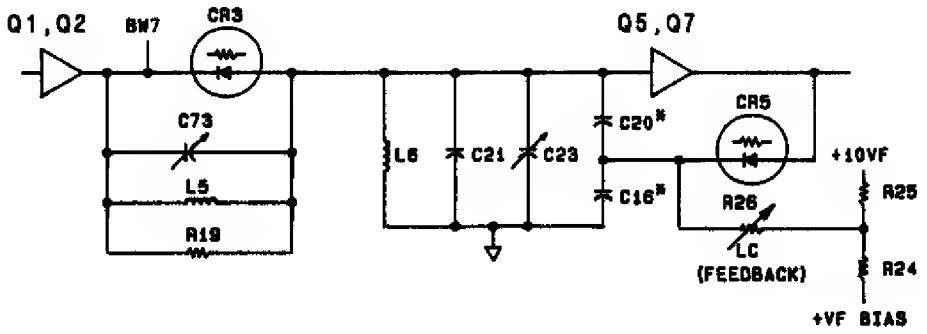


Figure 5–24. First LC Pole, Simplified Schematic

When an LC filtered bandwidth is selected, BW5F is at +15V; BW7F is at a voltage greater than or equal to +6.8V and supplies bandwidth–determining bias current to CR3. Supply line +VF BIAS is always at +6.8V. Control line BW5F reverse biases CR8 (block B), disabling the crystal pole, and forward biases CR1 (block B) opening the dc bias path to Q2. During LC operation, CR6 is reverse biased, keeping C28 out of the circuit. When a crystal filtered bandwidth is selected, BW5F forward biases CR6 and allows C28 to ground the signal path.

Unity Gain Buffer Amplifier (E)

Operation of the Unity Gain Buffer Amplifier is similar to the 10–dB Input Buffer Amplifier, except that it has an FET input (Q5) and unity gain. The input signal path is activated by the BW5F line, which switches on CR9 during LC mode or CR8 during crystal mode.

When the crystal mode is selected, the current though the input FET (Q5) is determined by Q6 and constant sink Q7, which sinks about 4 mA. During LC mode, current is supplied through R37 and CR10 from BW5F. The input FET current is a good indication of the stage's operation and can be monitored by measuring the gate–to–source voltage. This voltage should fall between +0.2V and +1.5V. An increase in current decreases the voltage.

Capacitor C68 and L19 form a feedback circuit that tunes Q7 to 21.4 MHz. Trimmer Resistor R31 (XTL FEEDBACK) adjusts the feedback and controls the stage gain, as do R5 and R6 in block (B).

Second XTAL Pole (G)

The operation of the Second Xtal Pole is the same as the First Xtal Pole.

Second LC Pole (F)

Operation of the Second LC Pole is the same as the First LC Pole, except that R56* performs the same function as PIN diode CR5.

Output Buffer Amplifier (H)

The Output Buffer Amplifier is composed of a complementary pair of transistors. Transistor Q9 is a source follower with its output current boosted by Q10. The current through input FET Q9 is established by R53:

$$I_{FET} = \frac{V_{be(Q10)}}{R_{53}}$$

which becomes: I_{FET} = .7/196, or about 3 mA

The total current through Q9 and Q10 is set by R54. The input signal path is selected by either CR15 (during crystal mode) or CR16 (during LC mode).

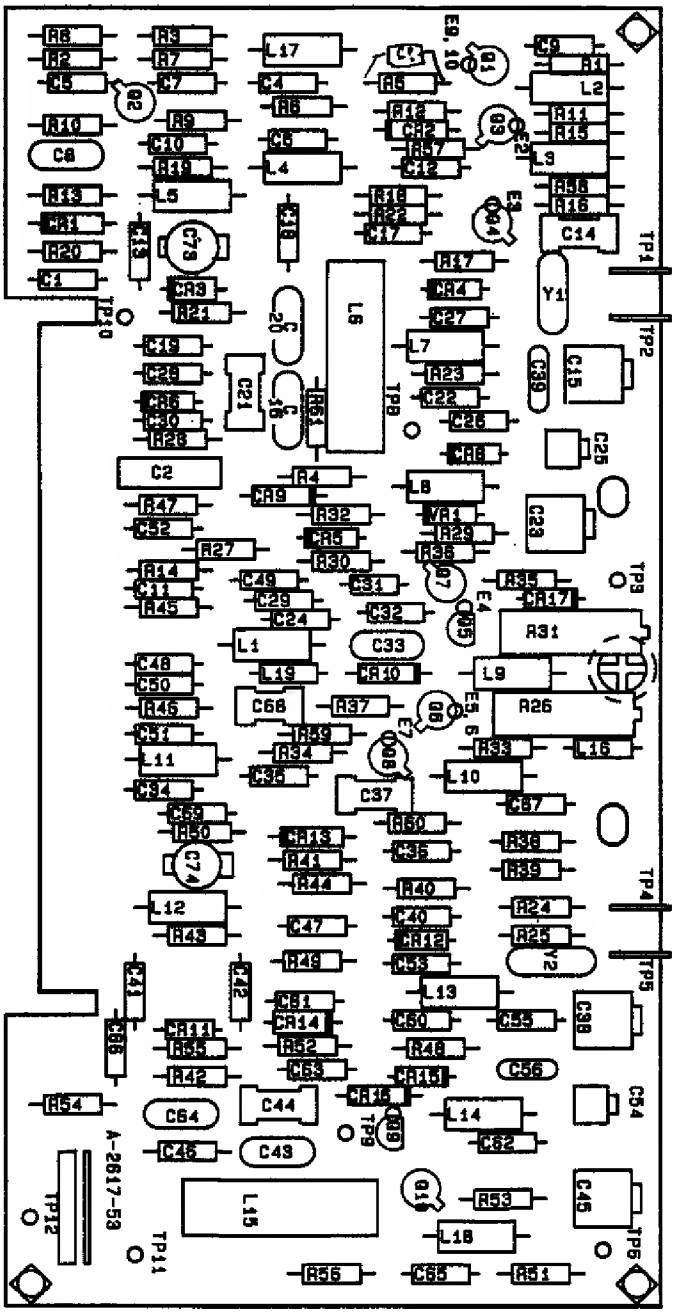


Figure 5–25. Bandwidth Filter Component Locations